Amendment No.31 - 1.1.72

PREFACE

This Metering Instruction Book sets down the detailed methods and procedures that must be followed by Connecting Officers and Meter Fixers in carrying out their daily work. The standard practices set out will provide uniformity in metering layouts and methods and ensure that each installation is correctly and adequately metered in accordance with the Rate or Rates applicable. The standard methods must, therefore, be strictly followed in all cases except where specific instruction to the contrary is given by a supervisor.

This book supersedes and amplifies all existing instructions dealing with metering practices and methods. In the main, it covers the metering arrangements in common use but it also covers arrangements which will seldom be met, so that officers who have not previously encountered such cases will be able to deal with them readily by reference to the book.

So that officers may have an understanding of the equipment they install and of its functions, brief descriptions have been included of the various types of meters, metering transformers, control equipment etc. used by the Council together with some simple and basic technical trade training. Also, brief details are given of certain procedures in the requisitioning of equipment etc. which, although primarily of concern to supervisors and clerical officers, are also of interest to Connecting Officers and Meter Fixers in giving them a better understanding of their work.

The book will be added to or amended from time to time as new equipment comes into use or procedures are developed or modified. Each officer to whom a book is issued shall see to it that it is kept in good order and up to date.

K Burns

ELECTRICAL INSTALLATION SUPERINTENDENT

METERING INSTRUCTION BOOK

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ELECTRICAL UNITS.

WATT.--	The practical **unit** of power. Symbol W.
KILOWATT.--	A unit of power equal to 1,000 watts. Symbol kW.
WATT-HOUR.--	A unit of energy. It is the energy expended in one hour when the power is one watt. Symbol Wh.
KILOWATT-HOUR.--	A unit of energy equal to 1,000 watt-hours, and is the standard unit for measurements of electrical energy used for commercial supply purposes. Symbol kWh.
AMPERE HOUR.--	A commonly employed unit of electrical quantity. The quantity measured in ampere-hours is equal to the product of the average current in amperes and the time in hours during which it flows. Symbol Ah.
KILOVOLT-AMPERE.--	1,000 volt amperes. Symbol kVA.
HORSE POWER.	A practical unit of power. The British horse power is equal to approximately 746 watts. Symbol H.P.
MEGA.--	A prefix used to denote one million.

INSTRUMENTS AND METERS

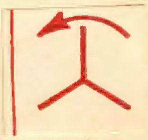
AMPERE-HOUR METER.	An integrating meter for measuring a quantity of electricity expressed in ampere-hours. When used on a constant voltage system it is often calibrated to register in kilowatt-hours.
KILOWATT-HOUR METER.	(Energy Meter) A meter for measuring electrical energy expressed in kilowatt-hours.
TWO RATE METER.	An energy meter provided with two registers, one or the other of which is engaged with a driving element according to the setting of a time switch, so that the energy used during predetermined times may be separately registered.
DEMAND METER OR MAXIMUM DEMAND INDICATOR.	A meter which indicated or records the maximum response by the meter to the quantity metered. (Amps. kVA, kW, etc.)
THERMAL INSTRUMENT.	An instrument, generally a demand meter, the operation of which depends on the heating effect of a current or currents.
COMBINED ENERGY AND KILOWATT DEMAND METER.	This meter, as used by the Council, consists of an energy meter fitted with a device which indicates on another dial or register the maximum average power demand in kilowatts. The power is averaged over 30 minute intervals.

AUXILIARY APPARATUS

INSTRUMENT TRANSFORMER.	A transformer for use with a measuring instrument, relay or similar piece of apparatus, and in which the design aims at maintaining with precision under specific conditions a given relationship as regards magnitude (usually proportionally), and phase displacement (usually 180 degrees), between the primary and secondary voltages or currents as the case may be.
CURRENT TRANSFORMER. (C.T.)	An instrument transformer for the transformation of current, usually to a lower value.
POTENTIAL TRANSFORMER (V.T.)	An instrument transformer used generally for, transforming a high supply voltage to a lower voltage suitable for the instrument.
TIME SWITCH.	A switch embodying a clock or equivalent mechanism (mechanical or electrical) which may be set to open and close a circuit at predetermined times.
CONTACTOR.	A mechanical device for frequently making and breaking an electric circuit. It is usually operated electromagnetically.
RHYTHMATIC RELAY.	A relay which is sensitive to an audio frequency pulsed into the power network at a predetermined rhythm or rate and is used to control loads such as storage water heaters, street lighting etc.
D.C. BIAS RELAY.	A relay which is operated by a D.C. voltage applied to the neutral at the Distribution Centre and is used to control loads such as storage water heaters etc.

METERING ACCESSORIES

NEUTRAL CONNECTOR BOX.	At one time called a "shunt link", is a small covered link, suitable for sealing, to which a conductor from the service neutral link or bar is connected and from which neutral conductors (shunt wires) are taken to each of a number of meters, time switches etc. See figure 1, A and B.
REDUCING LUG,	is a tunnel type lug enabling a cable up to size 37/.064 to be connected to the line and load terminals of single phase whole current meters. A terminal is provided in each lug by which the current coil of the meter may be bridged to maintain supply when testing or replacing meters. A masking piece is placed over the cables prior to connection to the lug. See figure 1, C and D.
METER CONNECTOR BLOCK,	is an arrangement of terminals by which the current coils of whole current meters may be bridged to maintain supply when testing or replacing meters. See figure 1, E and F.
TEST BLOCK,	is an arrangement of terminals used with Current Transformer metering to which the metering neutral conductor, the potential coil active conductors and the secondary current circuit conductors may be connected for testing purposes and by which the current transformer secondary circuit may be bridged when testing or replacing meters. See figure 2.
POTENTIAL FUSE	is a 2 ampere high rupturing capacity cartridge type fuse used to protect the "potential" circuits of C.T. and other metering as required. See figure 3A.
CONNECTING OR METERING LINKS	are links provided for the connection of more than one customer, or a customer at more than one rate, to a service fuse or at a point remote from the service fuse. e.g. rising or extended mains.
PARALLELING LINKS,	(or room blocks or room links) are an arrangement of links, connected in the load conductor between meters and the customer's switchboard, to enable the wiring in a room or rooms to be metered separately or in parallel as required.
FLAG LUG	is pressed copper lug for connection of small cables to either ½" or ⅝" studs. See figure 3B.
CABLE CONNECTOR	is a solderless "straight through" device for joining cables. See figure 3C.

LINE CONNECTOR	is a solderless clamp type connector used for the connection of consumers mains at the point of attachment. See figure 3, D.
BUTTON INSULATOR	is a porcelain insulator with a centre fixing hole for mounting under meter boards. See figure 3, E.
METER TAG	is a card held in a metal holder with a hole suitable for fixing. See figure 3, F.
PHASE SEQUENCE STICKER	is an adhesive sticker bearing the anti-clockwise phase sequence symbol as illustrated. 
UNMETERED SUPPLY STICKER	is an adhesive sticker bearing the letters "U/M" as illustrated, signifying unmetered supply.

TESTING EQUIPMENT AND TOOLS

PHASE SEQUENCE INDICATOR	A testing instrument for use on a polyphase system, and serving to indicate the sequence in which the conductors connected to its terminals reach maximum voltage.
TEST LAMPS	consist of two, 240 volt, 15 watt bayonet cap lamps connected in series and suitably housed with two flexible leads and test prods attached.
SINGLE PHASE TEST LOAD	is a bayonet cap carbon filament lamp of approximately 130 watts, constructed as a portable hand lamp with two flexible leads, a test prod and battery clip attached.
CONTINUITY TESTER	is a battery operated lamp or buzzer, suitably housed with two flexible leads attached.
SERVICE SPANNERS	consist of a number of sockets for use with a common insulated handle.

TERMS AND ABBREVIATIONS FOR COUNCIL'S SERVICE AND METERING EQUIPMENT.

HINGED SERVICE BOARD (H. Ser. Bd.)	The Domestic Standard Service and Meter Board.
SERVICE SURROUND. (Ser. Srd.)	The approved metal surround on which the Domestic Standard Service Board is mounted.
COMPACT SERVICE BOX. (Cpt. Ser. Bx.)	The approved Compact Weatherproof Box for the Domestic Standard Service Board.
WEATHERPROOF BOX. (Wp. Bx.)	Any weatherproof box, other than the Compact Service Box, suitable for housing the Domestic Standard Service Board or any other Service or Meter Board.
SERVICE BOARD. (Ser. Bd.)	The general practice wooden Service Board, of various specified dimensions, which is mounted on wooden battens for the installation of Service Fuses with or without Meters.
METER BOARD (Met. Bd.)	The general practice wooden Meter Board, of various specified dimensions, which is mounted on wooden battens for the installation of metering equipment only.
SERVICE CABINET (Ser. Cab.)	The 100/400 Amp Distribution Service Fuse Cabinet.
HOUSE SERVICE CABINET (Hse. Ser. Cab.)	The old single phase cabinet housing a Service Fuse and one Meter. No longer installed.

TERMS ASSOCIATED WITH METER TESTING AND READING

CREEP	The continuous rotation of a meter disc without the passage of a load current.
READING CONSTANT	The factor by which the reading on the dial or register of a meter is multiplied to obtain the true value of the quantity being measured.

TERMS USED IN METER INSTALLATIONS

LINE SIDE of a fuse, meter or other instrument refers to the terminals to which the incoming or "live" conductors are connected. e.g. consumer's mains or other unmetered conductors. That is the side electrically closest to the Council's supply mains.

LOAD SIDE of a fuse, meter or other instrument refers to the terminals to which the outgoing conductors are connected.

LOAD WIRES are those cables connecting the customer's main switch and, in some cases the neutral link, to the load terminals of the meter or other instrument.

WHOLE CURRENT METERING signifies the metering of an installation with meters where all of the load current passes through the current coil of a meter.

CURRENT TRANSFORMER METERING signifies the metering of an installation with meters where all of the load current passes through current transformers, the secondary load current of the transformer only passing through the current coil of the meter.

POLARITY is the term used to describe the line side or terminal of the primary of a current transformer and the corresponding secondary terminal. The "polarity" side or terminal of a C.T. is identified by a "polarity" mark.

TERMS USED IN METER INSTALLATIONS

LINE SIDE of a fuse, meter or other instrument refers to the terminals to which the incoming or "live" conductors are connected. e.g. consumer's mains or other unmetered conductors. That is, the side electrically closest to the Council's supply mains.

LOAD SIDE of a fuse, meter or other instrument refers to the terminals to which the outgoing conductors are connected.

LOAD WIRES are those cables connecting the customer's main switch and, in some cases, the neutral link to the load terminals of the meter or other instrument.

DIRECT CONNECTED (WHOLE CURRENT) METERING signifies the metering of an installation with meters where all of the load current passes through the current coil of a meter.
NOTE: The term "direct connected" is now the accepted standard term, however, the term "whole current" will be found in common use throughout this book. The obsolete term will be gradually replaced as amendments are made.

CURRENT TRANSFORMER METERING signifies the metering of an installation with meters where all of the load current passes through current transformers, the secondary load current of the transformer only passing through the current coil of the meter.

POLARITY is the term used to describe the line side or terminal of the primary of a current transformer and the corresponding secondary terminal. The "polarity" side or terminal of a C.T. is identified by a "polarity" mark.

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TERMS USED IN TRANSMISSION AND DISTRIBUTION RELATIVE TO METERING

PHASE SEQUENCE,	in a polyphase system of electricity, is the relative order in which each phase voltage reaches its maximum value, and is stated in terms "clockwise" and "anticlockwise".
SINGLE PHASE	A qualifying term applied to a system or apparatus to denote one in which there is a single alternating voltage.

SYSTEMS:

(a) TWO WIRE SYSTEM. A two wire system D.C. 240 volt (nominal), or single phase A.C. system of electricity supply comprising two conductors between which, the load is connected.

(b) THREE WIRE SYSTEM. A system of distribution with D.C. or A.C. comprising two active conductors and a middle or neutral wire, the supply being taken from the middle wire and either outer conductor, the neutral wire carrying only the difference current and being connected to earth at the distribution centre. Supply is sometimes given as well from the two outer active conductors only, omitting the neutral conductor. However this is referred to as a single phase, 415 volt system.

(c) THREE PHASE, THREE WIRE SYSTEM. Three phase, three wire system of alternating current supply comprises three active conductors between successive pairs of which are maintained nominally equal alternating differences of potential successively displaced in phase by one third of a period. Commonly known as the Delta system.

(d) THREE PHASE, FOUR WIRE SYSTEM. Three phase, four wire system of alternating current supply comprises four conductors, three of which are connected as in a three phase, three wire system, the fourth conductor being connected to the neutral or star point of supply, which is usually earthed at the distribution centre. Commonly known as the Star system.

(e) POLYPHASE. A qualifying term applied to a system or apparatus to denote one in which there are two or more alternating voltages.

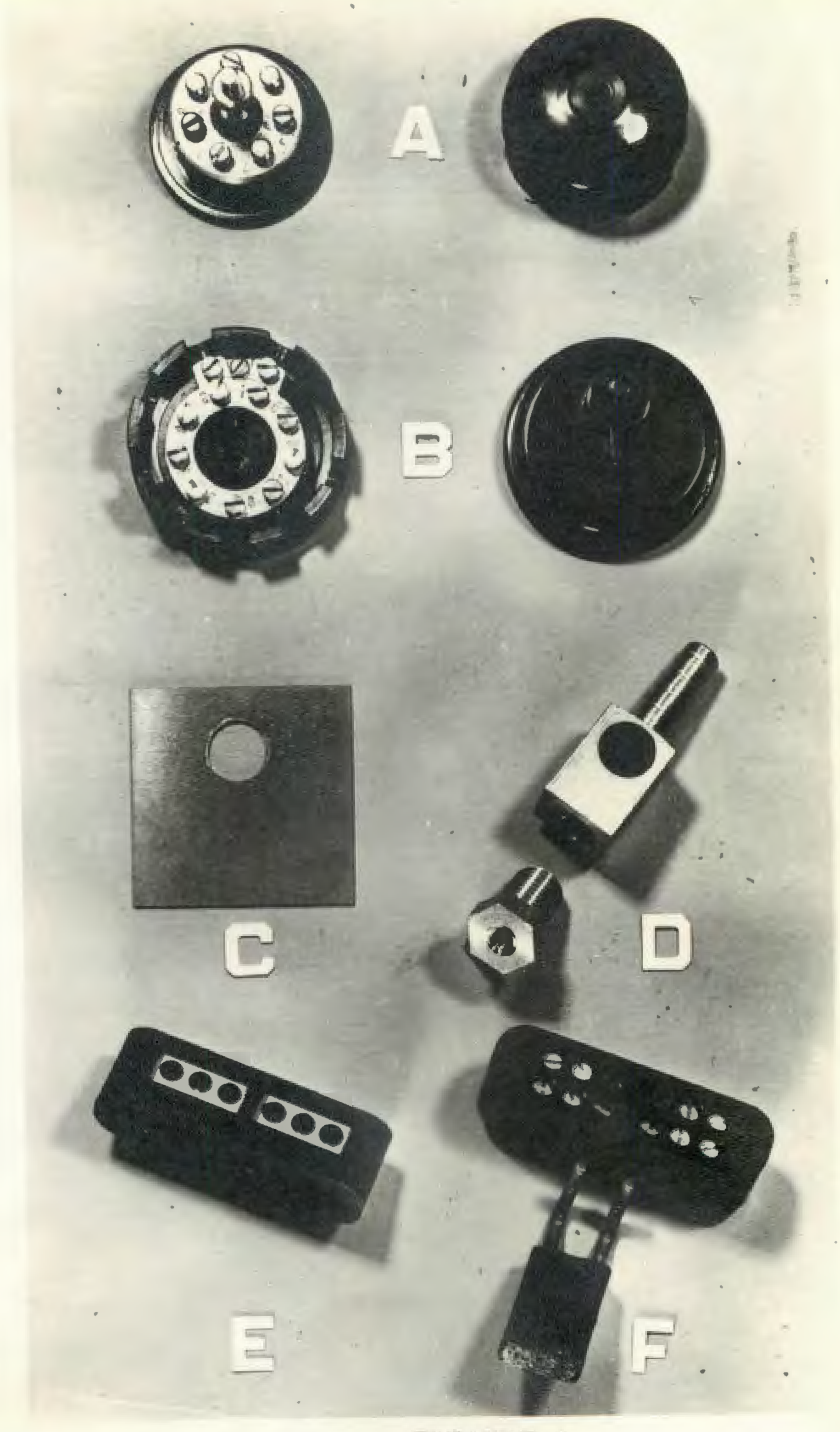

FIGURE I

A AND B : NEUTRAL CONNECTOR BOXES

C : MASK FOR USE WITH REDUCING LUG

D : REDUCING LUG E : METER CONNECTOR BLOCK

F : METER CONNECTOR BLOCK AND A SHORT CIRCUITING DEVICE

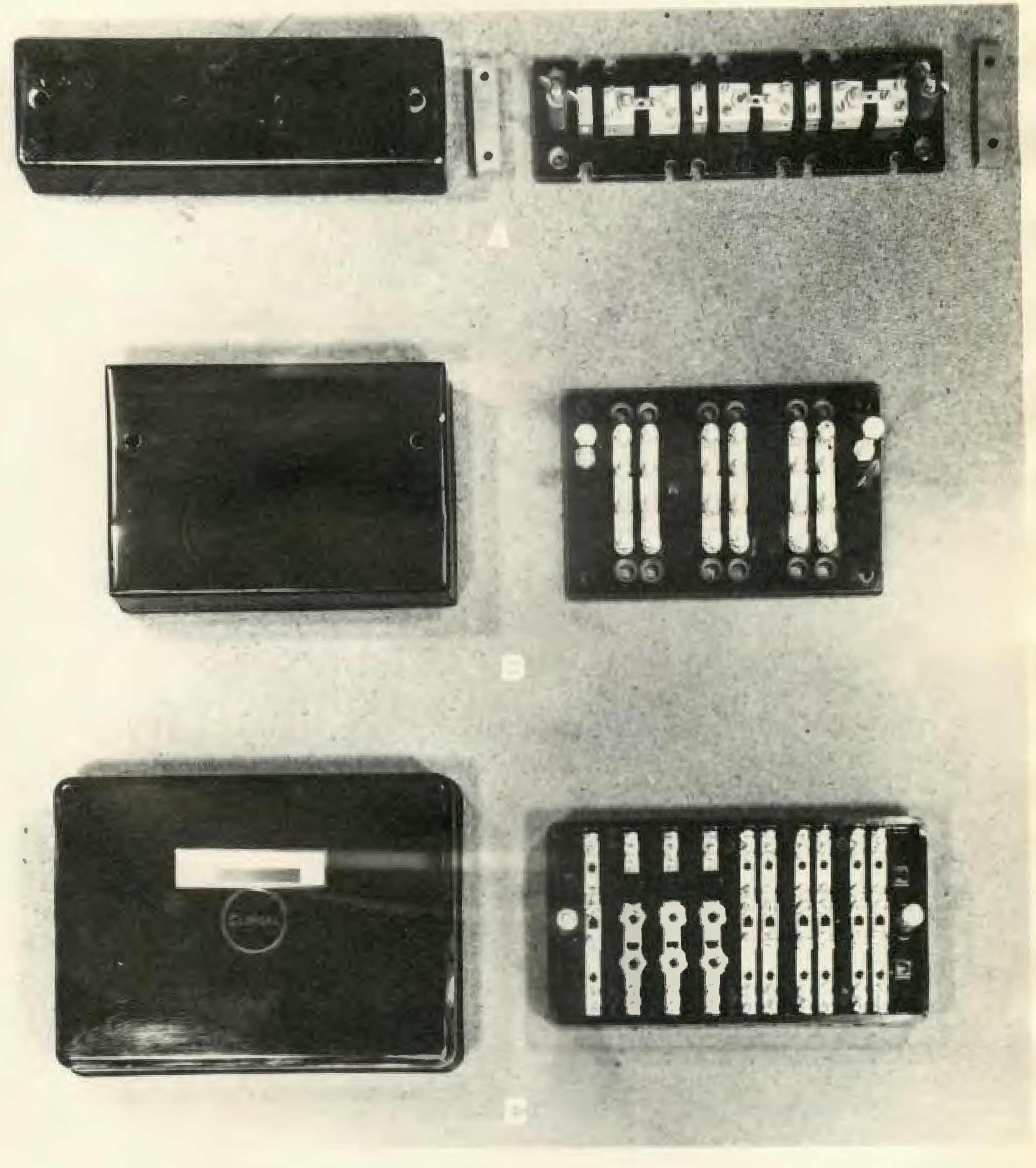

FIGURE 2

C.T. METERING TEST BLOCKS

A & B SUPERSEDED TYPES FOR CONNECTION OF THE SECONDARY CURRENT CIRCUIT CONDUCTORS ONLY

C PRESENT TYPE FOR CONNECTION OF METERING NEUTRAL, POTENTIAL COIL ACTIVE AND SECONDARY CURRENT CIRCUIT CONDUCTORS

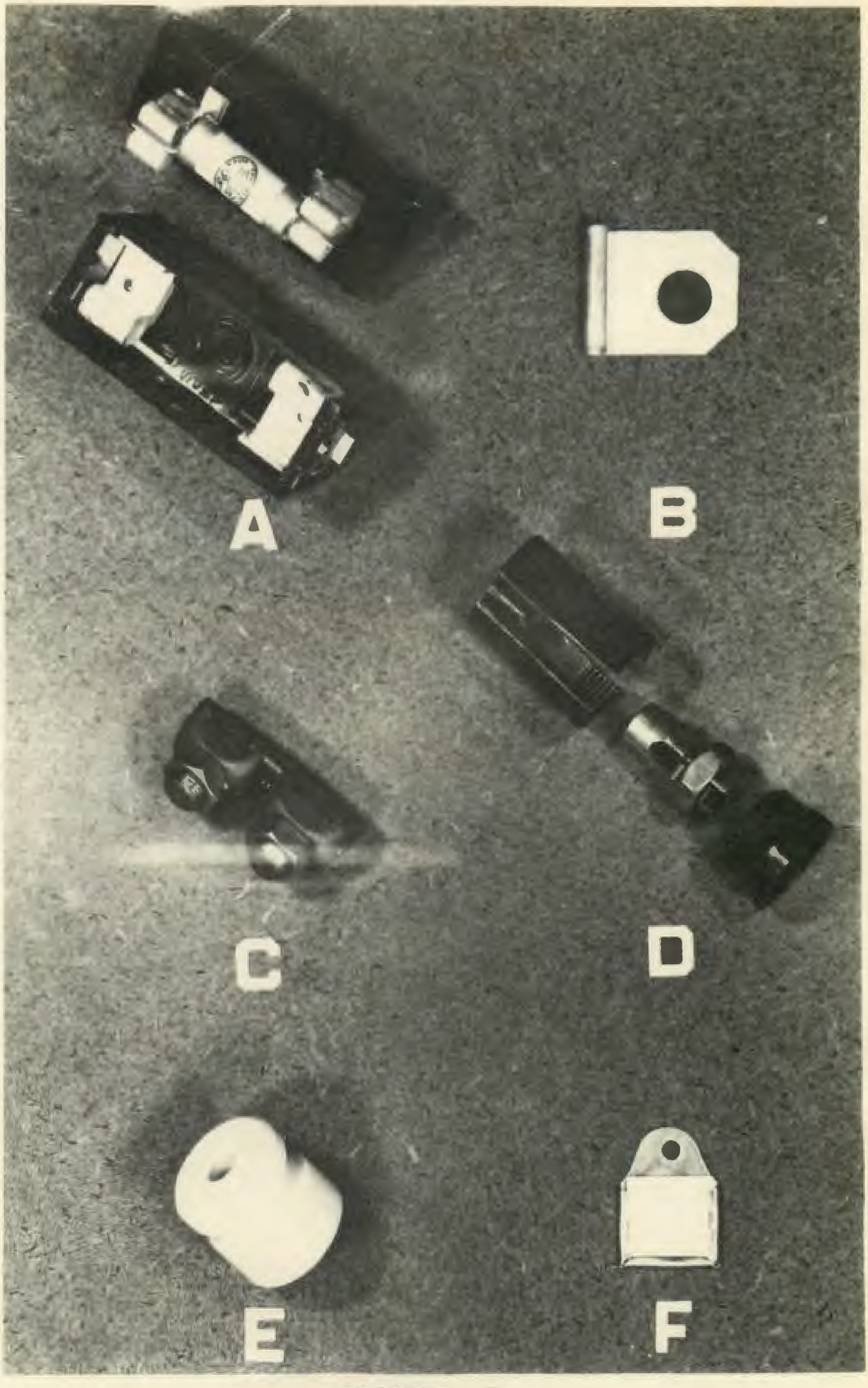

FIGURE 3

A: POTENTIAL FUSE. B: FLAG LUG. C: CABLE CONNECTOR.
D: LINE CONNECTOR. E: BUTTON INSULATOR. F: METER TAG.

SECTION 2

METER READING

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METHOD OF READING METERS

ENERGY METERS

For the purpose of this section the term "pointer" refers to both the pointer of a dial type register and to the digits of a cyclometer type register.

The relation between the speeds of adjacent dial pointers is 10 to 1. That is to say, one complete revolution of one dial pointer causes the next dial pointer on its left to rotate through one division or 1/10th of a revolution. No dial pointer rotates through one full division until the dial pointer next on the right has completed a revolution. (It should be noted that adjoining pointers rotate in opposite directions on a dial type register).

In reading an energy meter, the officer should stand directly in front of the meter and commence reading from the right hand unit dial. Each dial pointer to the left should be read in succession and the figures written down in the same order as read, i.e. from right to left.

When a **dial** pointer lies between two numbers, the lesser of the two numbers shall be read and recorded. If it is doubtful whether the pointer has actually passed a figure or not, this may be checked by observing the position of the dial pointer next on the right, remembering that no dial pointer will have moved from one division to the next until the dial pointer next on the right has completed a revolution. For example, if it is doubtful whether a dial pointer has or has not passed a figure (say, 8) then, if the dial pointer next on the right has not reached the zero mark (reading, say 7, 8 or 9), the pointer in question will not have passed the figure 8 and should be recorded as 7. However, if the dial pointer next on the right has passed the zero mark (reading, say 1, 2 or 3), the pointer in question will have passed the figure 8, e.g. the reading of the meter register shown in figure 1 is 9876780, and in figure 2, 0115800 high, and 0012700 low. When reading two rate registers it is imperative that both readings be taken and identified as shown in this example.

The fractional (decimal) dials on meters with a reading constant greater than (1) one must be read and recorded in all cases. However, the reading of fractional dials on the energy registers of all meters having a reading constant of one (1) must not be recorded but shall be used, as described above, only to indicate the correct reading of the unit dial on the left. This, of course, does not apply to the fractional dial readings of demand registers which must be recorded in all cases. (See "Combined Energy - kW Demand Meters", page 6 of this Section).

It will be noticed that on some meters designed to measure large consumptions, additional dials with a "dummy" pointer in the zero position have been painted on the register, e.g. figure 1 shows a painted pointed on the "kWh per div." dial.

Similarly, one and sometimes two "dummy" zeros are painted on some cyclometer type registers, e.g. figure 2 shows two painted zeros on both the high and low tariffs of a two rate register.

METERING INSTRUCTION BO - SECTION 2
Superseding existing pa 1 dated, 16.4.64.

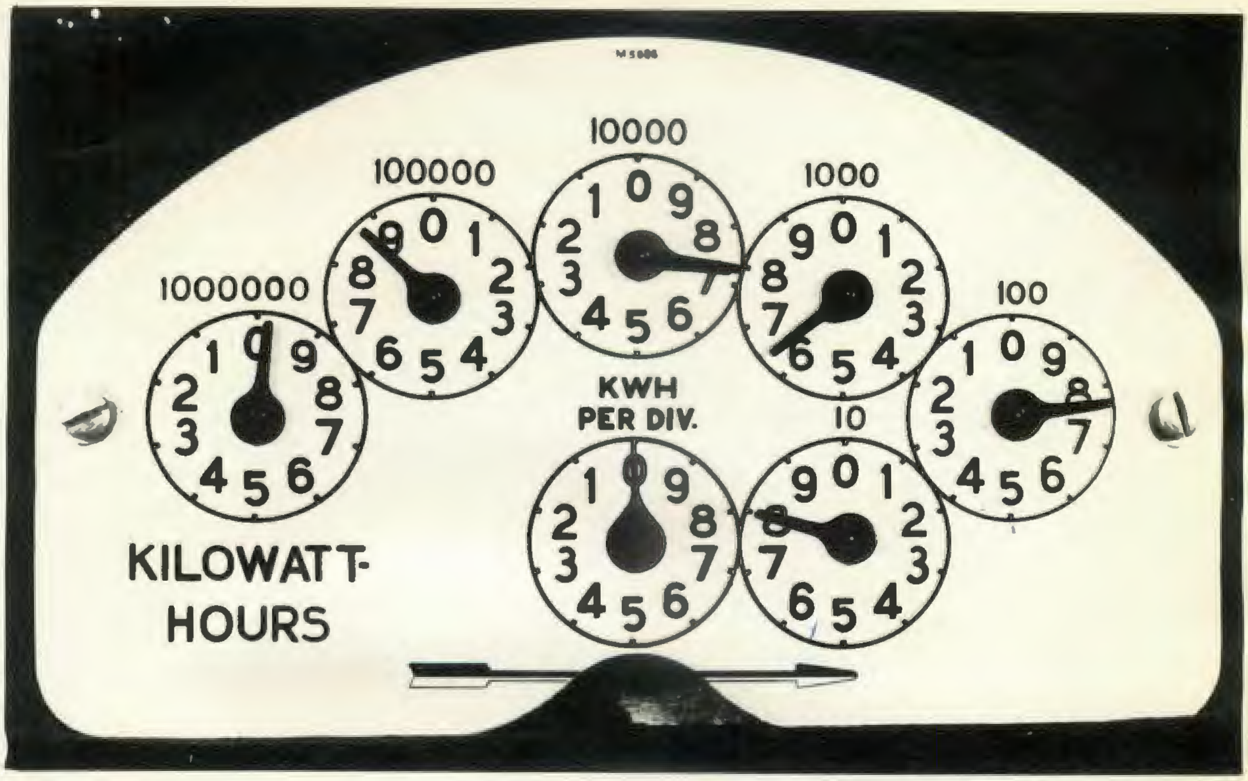

FIGURE 1.

DIAL TYPE METER REGISTER.

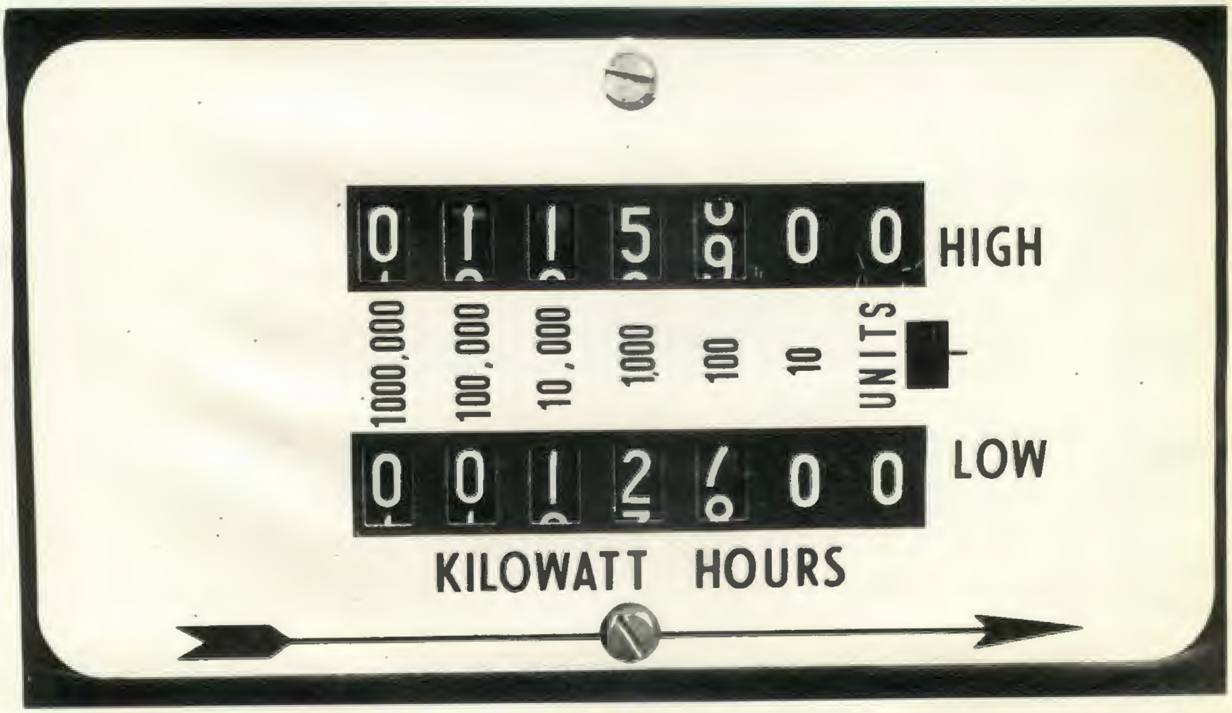

FIGURE 2.

CYCLOMETER TYPE TWO RATE METER REGISTER

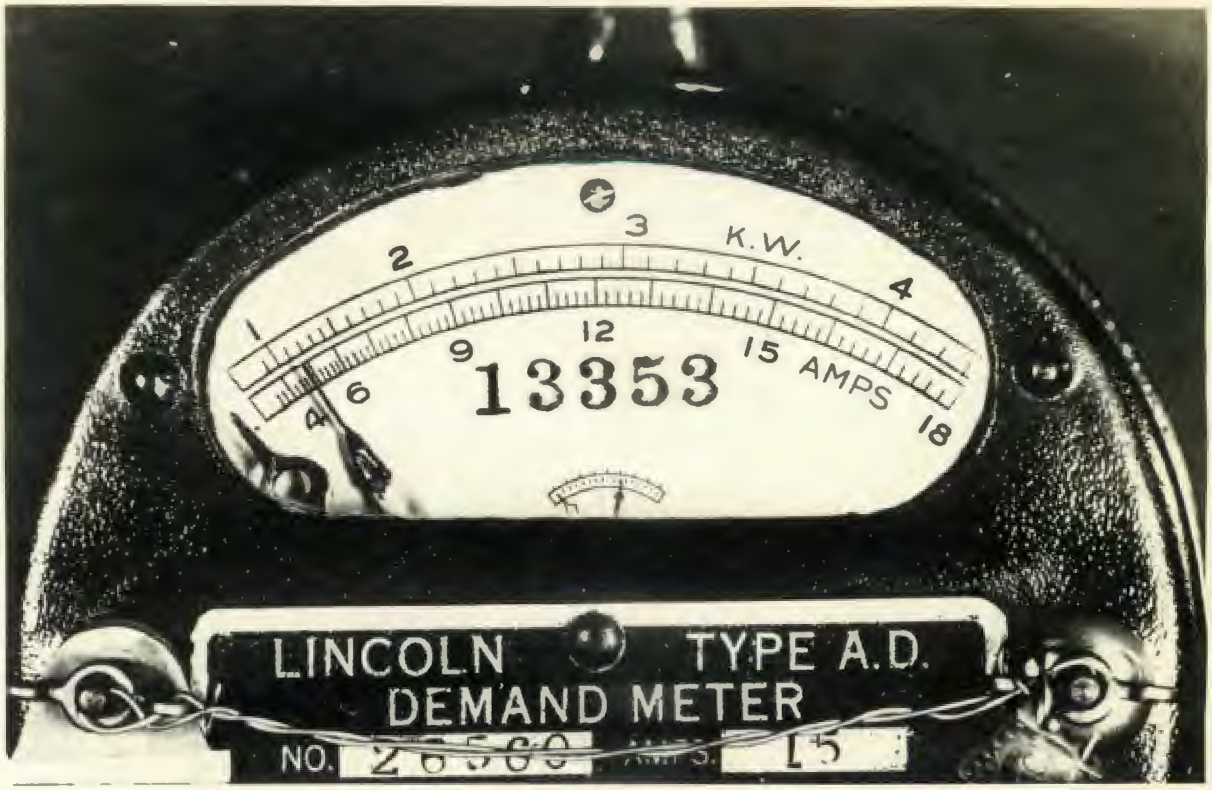

FIGURE 3.

DIAL OF MAXIMUM DEMAND INDICATOR TYPE L. (MD I/L)

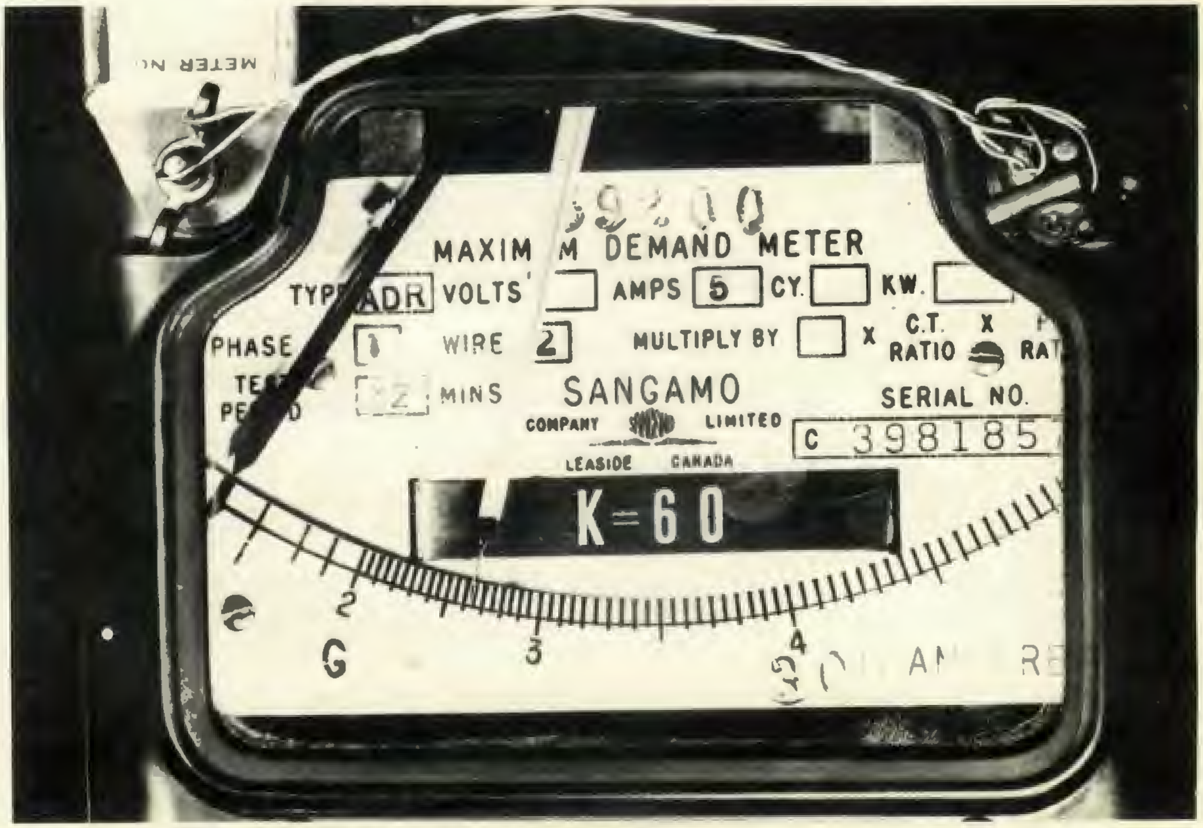

FIGURE 4.

DIAL OF MAXIMUM DEMAND INDICATOR TYPE LR (MD I/LR)

Particular care must be taken to ensure that these figures (0) are shown in all readings of these meters.

CONSTANTS

The READING CONSTANT (K) is the overall factor by which the reading of the register or dial is multiplied to determine the actual value of the quantity (kWh, kVa, amps, etc.) required to be measured by the meter concerned.

With the exception of some special instruments which will not be handled by the Inspection Branch, meters used by this Council have reading constants as follows:-

(a) Except for the Landis & Gyr type, C.T. connected, two rate meters in (c) below, all low voltage kWh. meters, both whole current and C.T. connected, have a reading constant of 1, the register gearing being such that the reading may be taken direct.

(b) All low voltage, whole current, Combined Energy - Kilowatt Demand meters have a reading constant of 1, the register gearing being such that the reading may be taken direct.

(c) All low voltage, C.T. connected, Combined Energy - Kilowatt Demand meters and Landis & Gyr type, C.T. connected two rate kWh meters have a reading constant equal to the C.T. ratio. e.g. 400/5 C.T.; K equals $\frac{400}{5} = 80$.

(d) All low voltage maximum demand indicators have a reading constant of 1, unless they are connected to current transformer secondary circuits, in which case the reading constant is the ratio of the C.T. e.g. 400/5 CT; K equals $\frac{400}{5} = 80$.

(e) All high voltage kWh meters and Maximum demand indicators are connected to current and voltage transformer secondary circuits, thus the reading constant of a kWh meter or M.D.I. is the product of the C.T. and V.T. ratios. e.g. 80/5 CT; 11,000/110VT; Therefore, the reading constant for a kWh meter would be

$$K = \frac{80}{5} \times \frac{11,000}{110}$$

i.e. $K = 16 \times 100 = 1600$.

In most cases the M.D.I. used on H.V. installations has a scale graduated from 0 to 1000 therefore the reading constant in the above example would be $\frac{1600}{1000} = 1.6$ kVa, K.W. or K.V.A.R. according to the demand being measured. Other constants may exist where recorders and thermal convertors are used.

(f) Additional or subsidiary meters may be installed under the terms of Service Rule 17 to enable a customer to know the consumption or demand in a section of an installation. Sometimes when such sub-metering is for a balanced 3 phase load, a meter may be

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connected in one line only and the reading constant would then be three times the constant mentioned in (a), and (b) above.

In all cases except high voltage metering, (e) above, where a reading constant greater than one exists it will be marked on the register or dial by the letter "K" followed by a number or by the words "Multiply by" followed by a number.

When recording the reading of any meter with a constant greater than 1, the constant must be shown in the space provided on some documents or immediately after the reading where no specific place is provided. e.g. The reading of the M.D.I. shown in figure 4 would be recorded as follows:-

Meter No. 39200 Reading 2.6 x K60.

The reading constant will be marked on each instrument by the Meter Branch, it being known to them by the ratio of the transformers as shown on the meter requisition slip, but if it is intended to connect a meter in one phase only of a balanced 3 phase installation, as in (f) above, the Meter Branch must be notified on the requisition slip so that the constant (3) may be incorporated in the reading constant and shown on the meter prior to issue.

MAXIMUM DEMAND INDICATORS

(a) READING.

For the purpose of this section the term "pointer" includes both the pointer of an indicator of the Bimetallic Spring type and the level of the liquid in the index tube of the "Reason" type.

In the Bimetallic Spring type indicator, the black pointer records the maximum demand that has been made and it is this reading that is taken. The red pointer indicates the demand that is being made by the installation at the time of examination.

Before reading a maximum demand indicator, the value of the scale divisions shall be checked. Only the ampere scale of single phase maximum demand indicators shall be read, the kW scale, if any, being ignored. The officer reading the indicator must stand directly in front of the instrument.

When the pointer of a maximum demand indicator lies between any two markings on the scale, the reading shall be returned as that of the lesser mark. Where the pointer actually covers a scale mark, the reading shall be returned as the reading of that mark. e.g.

Figure 3: M.D.I. No. 13353, reading 4.8 amps.
Figure 4: M.D.I. No. 39200, reading 2.6 amps. K. 60.

If the pointer is in a position on or beyond the maximum numbered mark on the scale, the reading shall be returned as that of the maximum numbered mark on the scale with the addition of the words "above scale" or the letters "A.S.". For example, where the pointer of a maximum demand indicator, having a rating of 15 amperes with a scale numbered up to

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18 amperes, (figure 3) lies on or beyond the maximum numbered mark on its scale, namely 18 amperes, the reading of the instrument will be returned as "Above scale 18 amps." or "A.S. 18 amps". Any scale markings that may appear above the maximum numbered mark will be ignored.

Where the pointer of a maximum demand indicator is in a position below the minimum numbered mark on the scale other than zero, the reading shall be returned as that of the minimum numbered mark on the scale with the addition of the words "Below scale" or "B.S.". For example, where the pointer of a 15 ampere indicator (figure 3) lies below the minimum numbered mark on the scale, in this case 4 amps., the reading shall be returned as "Below scale 4 amps." or "B.S. 4 amps". Any mark below the minimum numbered mark being ignored.

Readings on such marks may, however, be of value for assessment purposes. Accordingly, if it is found that the pointer of an indicator lies on or above a scale mark appearing below the lowest numbered mark, the officer reading the indicator shall return the reading in the manner indicated above, but shall also record in brackets the reading indicated by the scale mark on or above which the pointer lies. For example, on an indicator rated at 15 amperes, the scale markings are numbered from a minimum of 4 amperes to a maximum of 18 amperes, it will be noted that on some scales two markings appear below the lowest numbered mark, namely 4, and further, that each scale division represents .2 amperes. Therefore, if the pointer lies on the lowest mark on the scale or between that and the second lowest mark, then the reading will be returned as "B.S. 4 amps. (3.6 amps)". To take another example, involving an indicator rated at 150 amperes, the scale markings of which are numbered from 60 amperes to 180 amperes, each division representing 3 amperes, it will be noted that on some instruments a number of markings appear below the lowest numbered mark, namely 60. If the pointer lies, say on the 5th mark below the 60 ampere mark, then the reading would be returned as follows:-

"B.S. 60 amps. (45 amps.)". However, in all "Below Scale" readings unless the pointer lies on or above a scale mark which appears below the lowest numbered mark, then no reference shall be made to such marks when returning the reading.

(b) RESETTING.

"Reason" type. There are only a few of this type of indicator remaining in service and they are only in use within the City area. (Illustrated in figure 1 Section 5).

To reset, the cover seal located on the top front of indicator should be broken, and the cover opened downwards. The glass tubes are then raised from the bottom, using the metal finger grip, to a position where the acid in the index tube will return to the U tube. The tubes and front cover are replaced and the indicator sealed.

"L" Type. There are two types of resetting devices on this indicator.

1. A lever is mounted on the front cover below the glass. The seal must be broken and the lever dropped out of the sealing stud and moved in an anti-clockwise direction. (Illustrated in fugure 2 Section 5, lever marked "A").

2. A stud of approximately ¼" diameter is situated under the indicator housing, in front of the terminal cover. A sealing pin is passed through the surrounding boss and through the resetting stud. Sealing wire being passed through this pin and sealed. It may be found that this pin is missing on some indicators and the sealing wire is then passed through the boss and resetting stud at least twice for strength.

After the removal of the seal and pin the resetting stud may be turned in a clockwise direction.

"L.R." Type. A lever is mounted on the top front of this indicator, after breaking the seal, the lever (Illustrated in fugure 3 Section 5) may be raised from the sealing stud and moved in a clockwise direction.

General. When resetting L type indicators the idle pointers must be moved back steadily to the end of the scale or to the active pointer when current is flowing, and the pressure slowly released from the resetting mechanism, otherwise the pointers may be bounced back onto the scale, giving a false reading.

An indicator must always be reset if,

1. Load is transferred from the indicator.
2. Load is rebalanced.
3. Wiring alterations to metering are carried out.
4. Work is done adjacent to the indicator which may cause increased registration.
5. Any other work is carried out which may cause increased registration.

To ensure that errors do not occur and before any work is commenced in relation to M.D.I's, a note shall be made of all readings.

AMT. No. 6 (10.7.64)

Attention is drawn to ~~B.S.I. No. 33~~3, Index No. 465 which requires the use of form C.I.I.16 to be signed by the customer's representative before indicators are reset or removed.

COMBINED ENERGY - kW DEMAND METERS
(See description of meters in Section 4)

Registers: (See figures 5 to 12)

The energy (kWh) and demand (kW) registers of the combined energy-demand meters in use are of the cyclometer type which, in addition to whole number dials, may incorporate one, two or three fractional dials denoting tenths, hundredths or thousandths. The portion of the dial plate around the whole number dials is coloured black while that portion around the fractional dials is coloured red and a decimal point is shown before the tenth dial.

The energy registers are identified by the letters "kWh" and the demand registers by the letters "kW". The letters "H" and "L" identify the high and low rate energy registers respectively on two rate meters.

The dials for the range of meters available are shown in figures 5 to 12 of this Section, however, in some special cases (e.g. summation metering) which will be readily recognised, a modified dial may be fitted which will not correspond to that illustrated for a particular meter size.

Reading:

The method of reading cyclometer type registers is the same as already established and described for "energy meters" on page 1 of this Section and as a reading constant greater than one (1) is applied to C.T. connected energy-demand meters, the readings of any fractional dials must therefore be recorded. (See Constants, (c) page 2). Fractional dials also exist on the energy registers of some whole current energy-demand meters where the reading constant is one (1), in which case, as with other meters having a reading constant of one (1), the readings of such dials shall not be recorded. However, the readings of any fractional dials on demand registers shall be recorded at all times.

The kW demand register is cumulative, therefore, the maximum demand over any given period is the difference between the last and present readings, taking into consideration any resets which may have occurred during the reading period. The present reading is obtained when the meter is reset and the stored demand is transmitted from the lost motion or "memory" gears to the demand register.

The reading of the demand register must be recorded before and after each reset.

Reset Procedure for Siemens Schuckert Meters (SS/ED and SS/ED.2R)

It is not possible to reset this meter unless the meter is energised. The meter is fitted with a synchronous motor, which, in addition to other functions, also operates the reset mechanism. No attempt must be made to reset an SS/ED type meter if the synchronous motor is not rotating. Operation of the motor may be checked by observing the rotation of the red and white disc through a semi-circular slot in the dial plate adjacent to the demand register. The reset mechanism is put in motion when it is engaged with the rotating synchronous motor by turning the reset key on the lower left corner of the meter case.

If a disconnection of supply is to be made by the System Operation or Mains Branch at a time prior to an officer's scheduled arrival to carry out work on an SS/ED type meter (e.g. overtime work), arrangements shall be made by the officer organising the metering to have the meter reset as late as possible on the last working day prior to the disconnection.

If the disconnection of supply is timed to coincide with the Connecting Officer's arrival, arrangements shall be made for the meter to be reset prior to the disconnection.

The procedure for resetting the meter is as follows:-

(i) Before any other action is taken, make a record of the reading shown on the demand register, showing the decimal point in the correct position and the reading constant if applicable.

(ii) Ensure that the synchronous motor is operating.

(iii) Unseal the reset key.

(iv) Slide the locking lever to the right as far as possible.

(v) Lift the locking lever until it is at right angles to its normal position. Hold the lever in this position with the left hand.

(vi) Turn the reset key clockwise until a loud click is heard. This is a mechanical operation which engages the synchronous motor with the reset mechanism; it cannot be overwound.

(vii) Observe the active and idle pointers on the graduated scale and wait until they return to the zero position. The active pointer will return quickly but the idle pointer may take some minutes to return if it is well up on the scale. During this process the cyclometer dials may be seen turning to an increased figure as the stored demand is added.

(viii) Read and record the new demand when the cyclometer dials have ceased turning.

(ix) Return the reset key to its normal position, i.e. in a horizontal position with the sealing holes to the left.

(x) Lower the locking lever into the slots of the reset key.

(xi) Slide the locking lever as far to the left as it will travel.

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Additional pages 6 to 11, to inserted after figure 4

(xii) Pass the sealing wire through the two sealing holes in the reset key. The wire should now be across the locking lever in such a way to prevent it moving to the right.

(xiii) Pass one of the free ends of the wire beneath the reset key and seal in the normal manner.

Reset Procedure for Landis and Gyr Meters (LG/ED and LG/ED.2R)

The reset mechanism of this meter is spring operated and may be reset even when the meter is not energised. The spring is loaded by turning the reset key on the top right hand side of the meter case.

The procedure for resetting the meter is as follows:-

(i) Make a record of the reading shown on the demand register, showing the decimal point in the correct position and the reading constant where applicable.

(ii) Unseal the reset key.

(iii) Move the locking lever and turn the reset key clockwise until the mechanism begins to operate.
The operation of the mechanism is recognised by a whirring noise. The whirring noise which is heard for a very short period whilst turning the key should be ignored and the key must be turned further until the noise is continuous.

(iv) Observe the active and idle pointers on the graduated scale and wait until they return to the zero position.
During this process the cyclometer dials may be seen turning to an increased figure as the stored demand is added.

(v) Make a record of the new demand when the cyclometer dials have ceased turning.

(vi) Return the locking lever into the reset key and seal through the hole provided so that the locking lever cannot be moved.

Resetting of Energy-Demand Meters.

Energy-demand meters must always be reset if:-

1. Wiring alterations to the meter are performed.
2. The meter is to be removed.
3. Any work is performed by a Council officer which may cause an increase in the demand.
4. A reset is requested by a Supervisor.

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Additional pages 6 to 11, to be inserted [illegible]er figure 4.

The utmost care must be exercised by all officers called upon to operate the reset mechanism of a combined energy-demand meter. Officers must ensure that the reset mechanism is operating satisfactorily on all occasions when a reset operation is undertaken. Defective mechanism or other unsatisfactory features noticed during resetting operations must be reported to the Meter Superintendent without delay.

Failure to obtain satisfactory readings as a result of faulty mechanism shall be reported to the Supervisor concerned so that appropriate action may be taken to notify the Accounts Section of the inaccurate reading.

Recording the Maximum Demand on Reset Form (C.I.I.-16A)

When the demand mechanism of any existing combined energy-demand meter is to be reset, it is desirable that a representative of the customer be present to check all readings with the Council's officer. Accordingly, before any officer operates the reset mechanism of an existing meter he shall ask a responsible representative of the customer to check all readings prior to and after each reset.

All readings thus taken must be recorded on a form in the booklet of C.I.I.-16A forms. The customer's representative shall be requested to place his signature in the space provided and the Council's officer shall sign in the space provided at the bottom of the form.

In a small number of single and two phase installations, thermal M.D.I's. may be installed in common with an energy-demand meter. In such cases the M.D.I's shall be reset under the same circumstances as the energy-demand meter and the reading shall be recorded on the reset form (C.I.I.-16A) which must be suitably modified to suit the reading in amperes.

The C.I.I.-16A forms are arranged in triplicate. The original copy shall be left with the customer or his representative, the two yellow copies shall be returned with the officer's work. One yellow copy will then be despatched to the Supervisor Customers Accounts and the other copy will be filed by the A.S.I.I.

Each officer shall carry a booklet of forms C.I.I.-16A on every occasion he has need to reset an energy-demand meter.

Before resetting the meter, the reading of the demand register shall be recorded on the reset form, C.I.I.-16A. This is the "Reading as found".

The meter shall be reset and the increased demand reading recorded on the second line on the reset form. This is the "Reading after first reset".

Provision is made for a third or "As left" reading on the reset form (C.I.I.-16A) which will generally be used by the Meter Branch after having made a second reset so that the demand established in the "memory" gear train during testing may be allowed for. Officers of this Branch will not normally have to make a second reset but for uniformity, an "As left" reading must be given by repeating the "Reading after first reset".

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Additional pages 6 to 11, to be inserted af . figure 4.

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Superseding existing page 10, dated 16.4.64.

The "As found" and "As left" reading must also be recorded on the Metering Record Sheet when a meter is removed.

Recording of Meter Readings:

The readings shown on the energy and demand registers at the time of fixing and removal of meters shall be shown in the appropriate columns of the Metering Record Sheet, (C.I.I.-10 or C.I.I.-12).

A reset shall be performed prior to removal of a meter and the "as left" reading shall be the demand reading shown in the "meters removed" section of the Metering Record Sheet.

When ever an officer is required to record meter readings, the readings shall be taken and recorded in accordance with the information set out below:-

(a) The registration shown on all dials of kW demand registers shall be recorded.

(b) The registration shown on all dials of kWh energy registers having a reading constant greater than one (1) shall be recorded.

(c) The registration shown on the whole figure dials only of kWh energy registers having a reading constant of one (1) shall be recorded. The registration of any decimal dials shall not be recorded.

(d) The registrations of dials in (a), (b) and (c) above, shall be recorded for the dials required even if they read zero.

(e) When the registration of decimal dials is recorded, care shall be taken to ensure the correct placing of the decimal point.

(f) The reading constant, (1, 30, 60 etc as the case may be), shall always be shown in the column provided on the Metering Record Sheets and other documents. Where no specific place is provided, such as in a hand written memo, and the reading constant is greater than one (1), the constant shall be shown immediately after the readings as shown in figures 9 to 12 of this Section.

(g) Where the energy readings of two rate meters are to be recorded, the letters "H" and "L" must precede the readings of the "high" and "low" registers respectively and the "H" reading shall be recorded above the "L" reading. See the readings recorded in figures 7, 10 and 12, of this Section.

Recording the Number of Register Dials:
(See also "Metering Record Sheets", Section 12)

The number of register dials required to be read shall be recorded in the "dials" column of the Metering Record Sheet and, where these include decimal dials, they shall be recorded so that the whole figure and decimal dials may be distinguished from each other. This is done by inserting a decimal point between the number of whole figure dials and the number of decimal dials, e.g. the number of dials in the kWh register shown in figure 9 is 5.1, denoting five whole figure dials and one decimal dial and the number of dials in the kW demand register is 2.3, denoting two "whole figure" dials and three decimal dials.

The registration of decimal dials on the energy registers of meters having a reading constant of one (1) shall not be recorded and the number of such dials shall, therefore, not be recorded.

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Superseding existing page 11, dated 16.4.64.

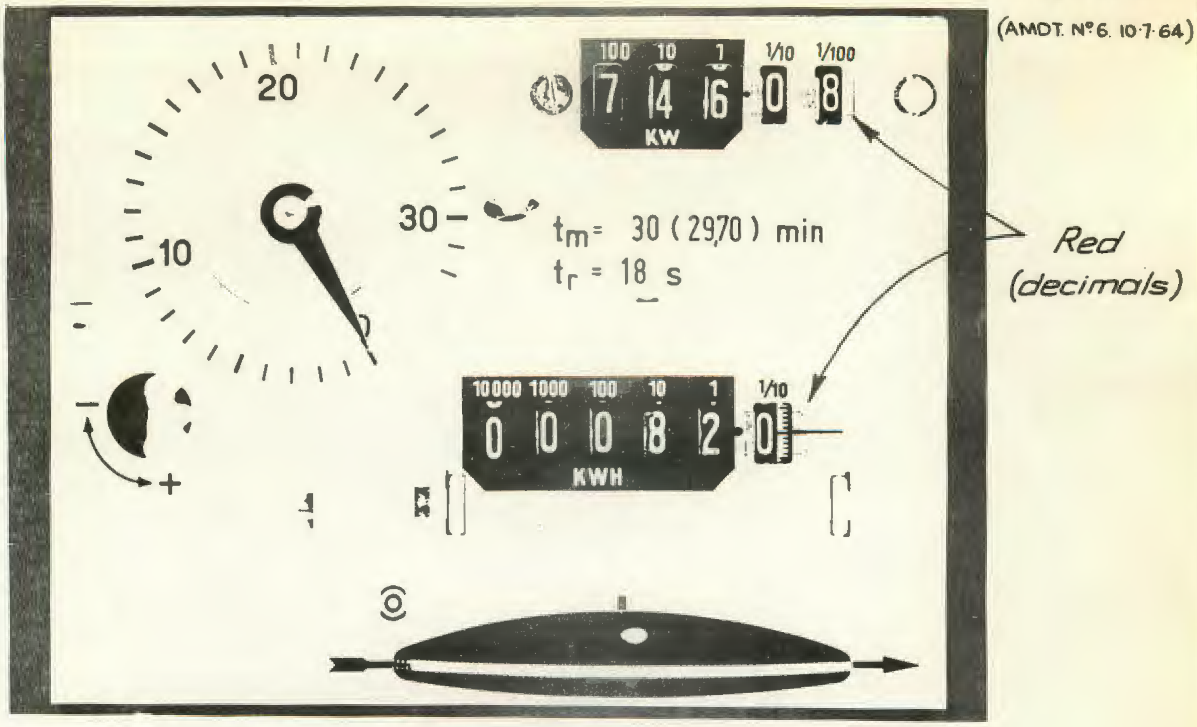

FIGURE 5

READINGS OF WHOLE CURRENT SS/ED, 3x10/40 AMP METER
DEMAND - 746·08 ENERGY - 00082

NOTE: THE READING OF THE FRACTIONAL DIAL ON THE ENERGY REGISTER IS NOT RECORDED, AS THE READING CONSTANT IS ONE (1)

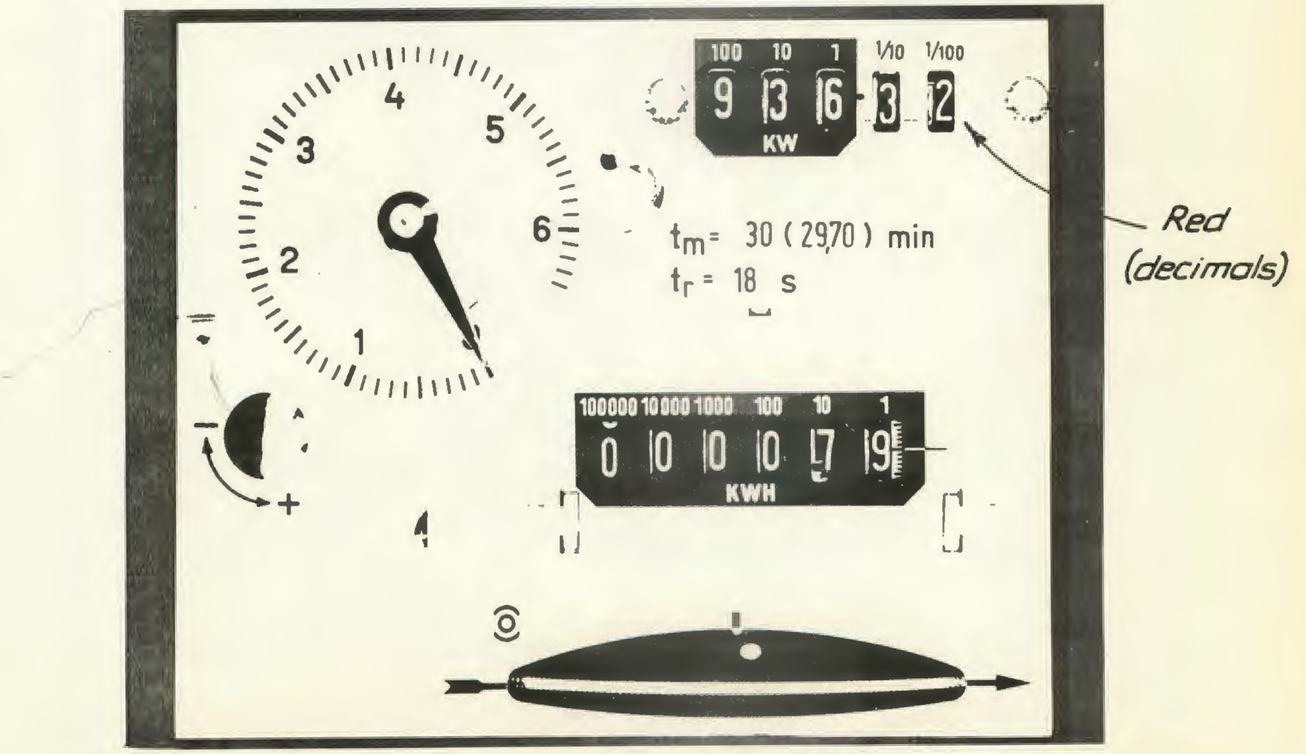

FIGURE 6

READINGS OF WHOLE CURRENT SS/ED, 3X20/80 AMP METER
DEMAND - 936·32. ENERGY - 000079.

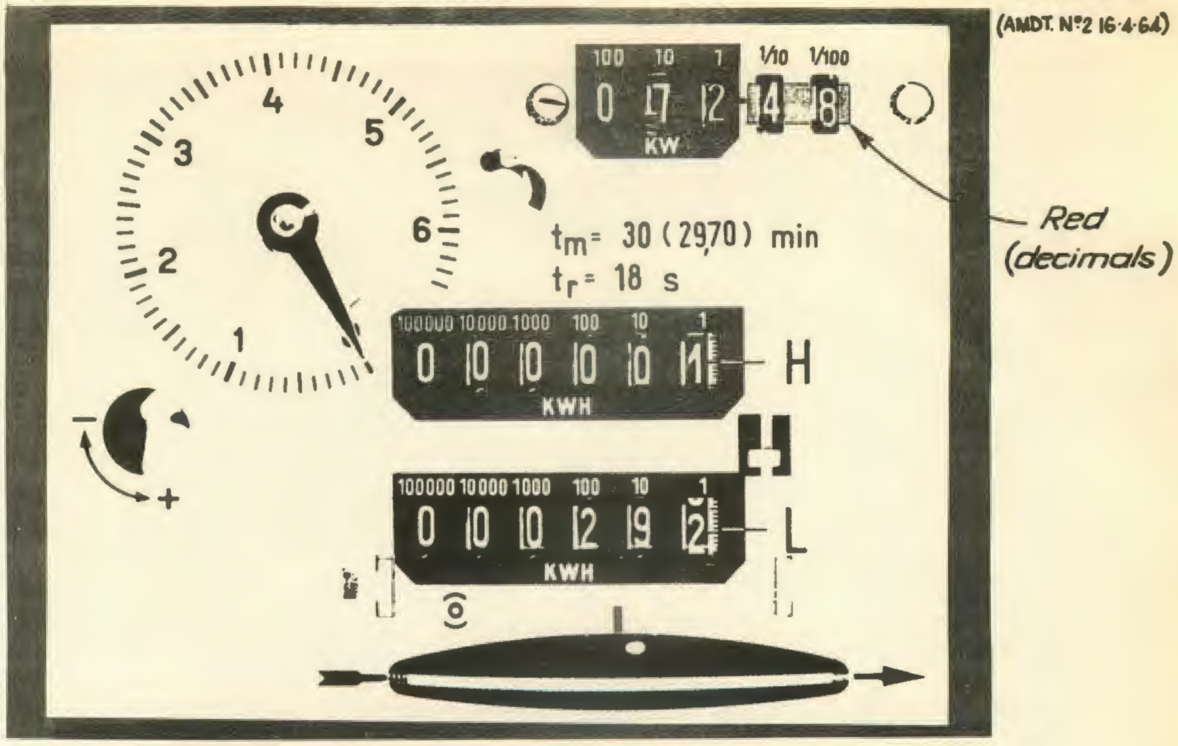

FIGURE 7

READINGS OF WHOLE CURRENT SS/ED. 2R, 3X20/80 AMP METER
DEMAND - 072·48. ENERGY - 'H' - 000001.
ENERGY - 'L' - 000292.

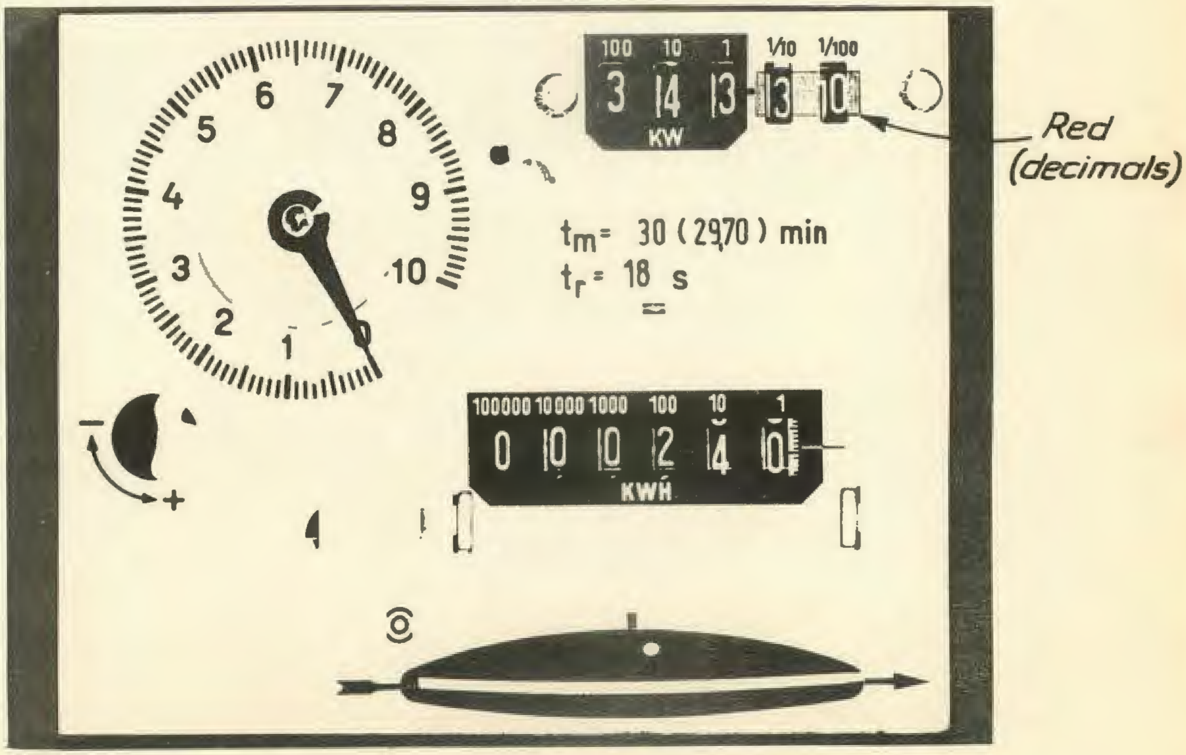

FIGURE 8

READINGS OF WHOLE CURRENT SS/ED. 3X30/120 AMP METER
DEMAND - 343·30. ENERGY - 000240.

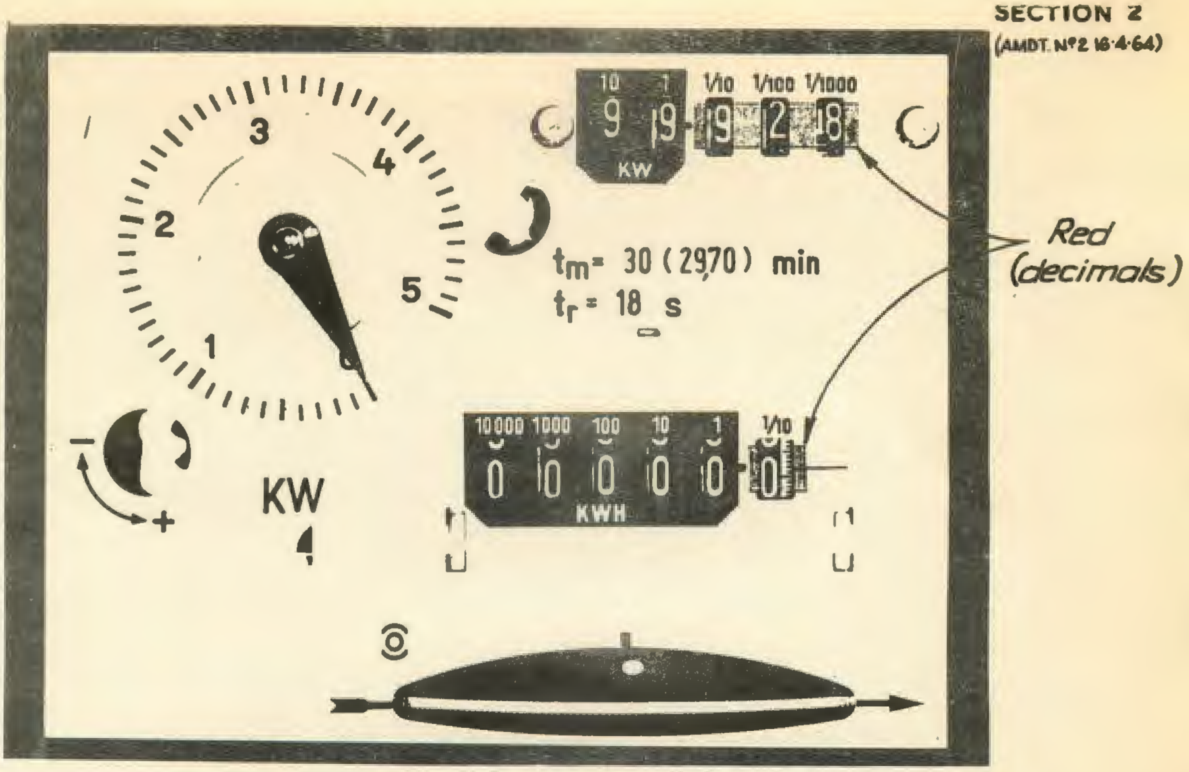

FIGURE 9

READINGS OF C.T. CONNECTED SS/ED. 5 AMP METER
DEMAND – 99·928 X K...... ENERGY – 00000·0 XK......

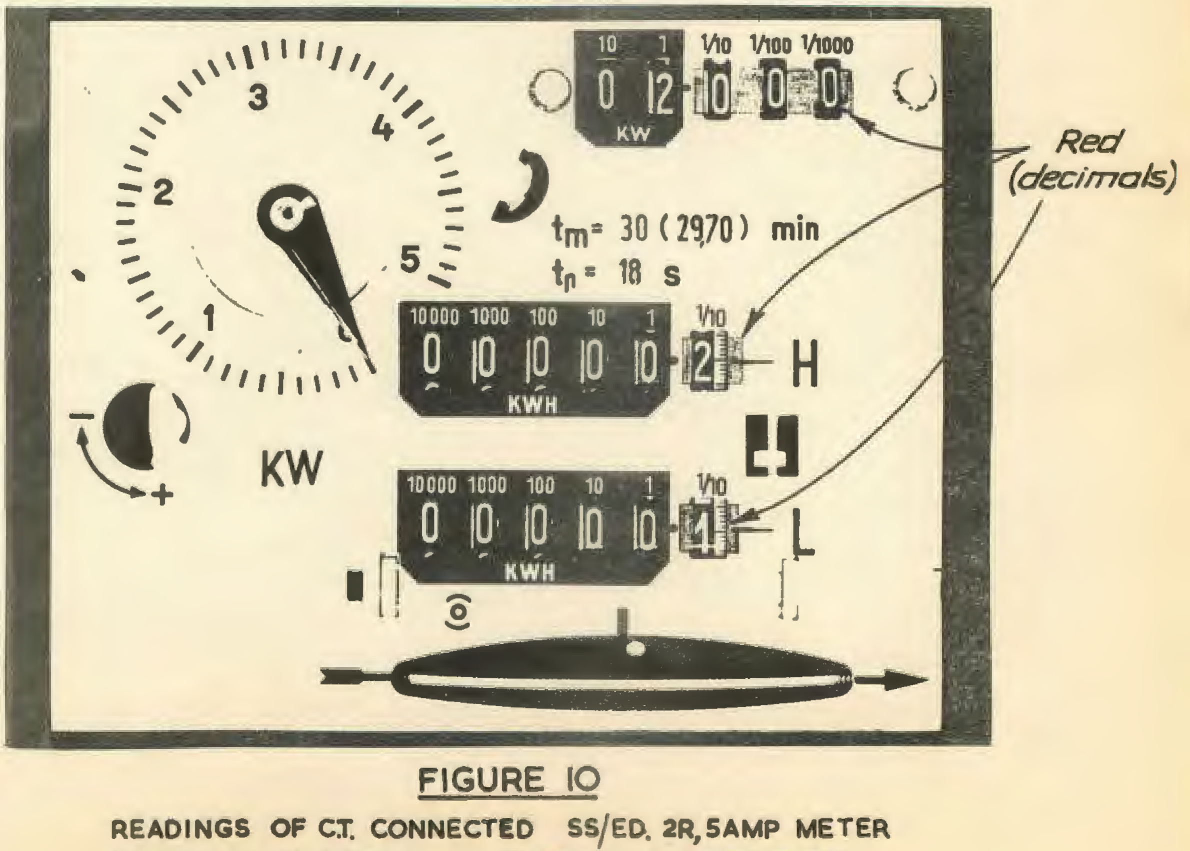

FIGURE 10

READINGS OF C.T. CONNECTED SS/ED. 2R, 5AMP METER
DEMAND – 02·000XK...... ENERGY –'H'– 00000·2XK.....
ENERGY –'L'– 00000·1 XK......

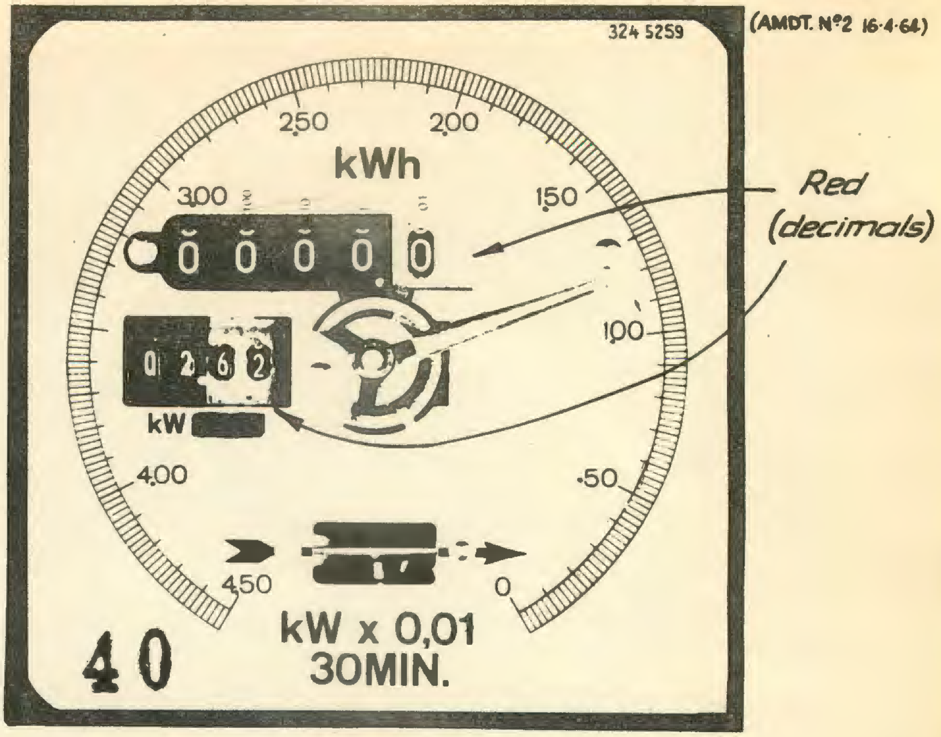

FIGURE 11

READINGS OF C.T. CONNECTED LG/ED. 5 AMP METER
DEMAND - 02·62 XK....... ENERGY - 0000·0 XK.......

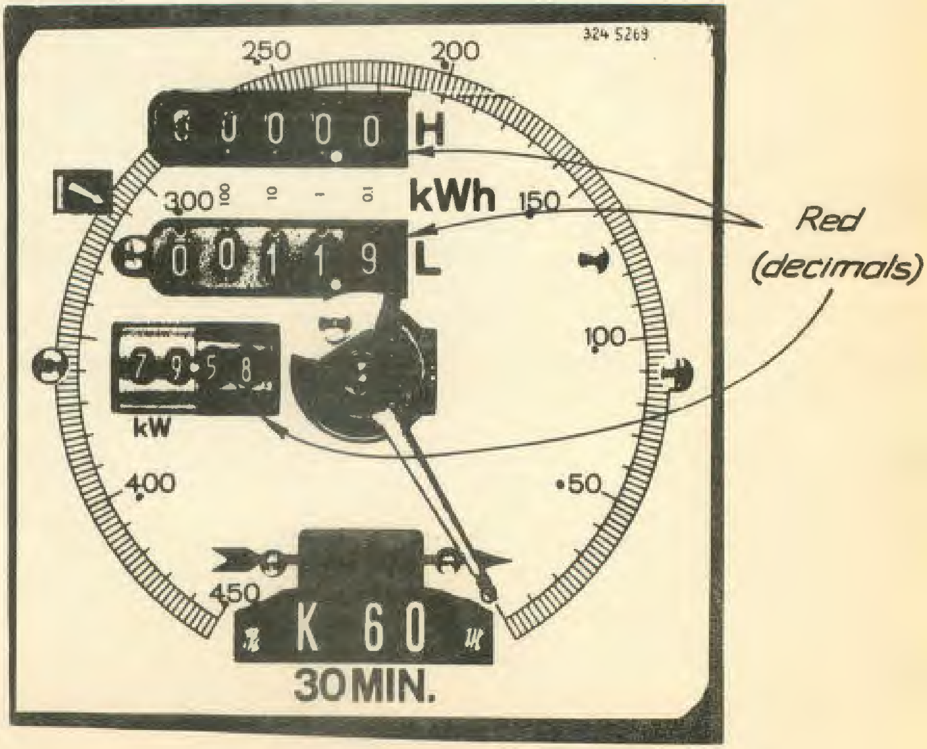

FIGURE 12

READINGS OF C.T. CONNECTED LG/ED. 2R, 5 AMP METER
DEMAND - 79·58 X K 60. ENERGY-'H'- 0000·0 X K60.
ENERGY-'L'- 0011·9 X K60.

SECTION 3.

DIRECT CURRENT METERS.

Mercury Motor Ampere Hour D.C. Meter. Page 1.

Description, Connections and Mounting. Page 2.

DIRECT CURRENT METERING

Mercury Motor Ampere Hour Meter. (figure 1)

There are several types of direct current meters but the description is given only of the type used by the Council, viz. the Mercury Motor Ampere Hour Meter.

The essential parts of a typical mercury motor ampere hour meter are:-

(a) Copper disc, free to rotate.
(b) Mercury bath in which the copper disc is mounted.
(c) Permanent magnet or magnets.
(d) Friction compensating coil.
(e) Register to integrate the revolutions of the disc, in terms of kilowatt-hours at the rated nominal meter voltage.

When it is required to measure heavy currents, this meter is provided with a shunt which carries the main current; only a small percentage of the current flowing through the meter. The resistance of the shunt and that of the current circuit of the meter together with the shunt leads, bear a definite constant relationship to each other. The length or cross sectional area of these leads must never be altered without recalibration of meter and shunt.

The main current, (or where a shunt is used, a proportion of it) enters the meter through the positive terminal, flows through the mercury and the disc and leaves by the negative terminal, or vice versa if reversed connected. The permanent magnets provide the necessary meter field and braking flux.

There is no potential connection to this meter, the driving torque is produced by the interaction of the field due to the current flowing through the disc, with the field of one of the permanent magnets. The greater the main current passing through the meter, the greater will be the driving torque, and so, neglecting friction, the speed of the disc is proportional to the current flowing.

It must be noted that in most D.C. meters a locking device for clamping the rotor and for preventing the spillage of mercury is fitted. Particular care must be taken to ensure that the locking device is locked before removing a meter from an installation and that it is unlocked after connecting a meter in an installation. The device usually takes the form of a screw which will turn to two positions - marked "A" in figure 1.

D.C. Meters will be found only in the Sydney City area and then only on lift, fire pump, and a few other special installations, since most installations in the City have been converted to A.C. supply.

Connections

There are three types of D.C. meters commonly used, viz. DC/F; DC/SAN; DC/MH. Each is enclosed in a metal housing and the terminal connections are as follows:

DC/F.	Left terminal, negative connection; right terminal positive connection.
DC/SAN.	Right terminal, negative connection; left terminal, positive connection.
DC/MH.	Right terminal, negative connection; left terminal, positive connection.

The positive terminals are clearly marked in each case. A negative conductor must not be connected to a positive terminal. If an error is made in connecting, the rotation of the meter will be reversed, it is then only necessary to reverse the connections to rectify this condition.

Mounting

It is most unlikely that new meter boards will need to be fixed for the mounting of any D.C. meter. They may be installed in any space on an existing board providing the usual requirements of access etc., are available. The method of fixing will be obvious upon sight.

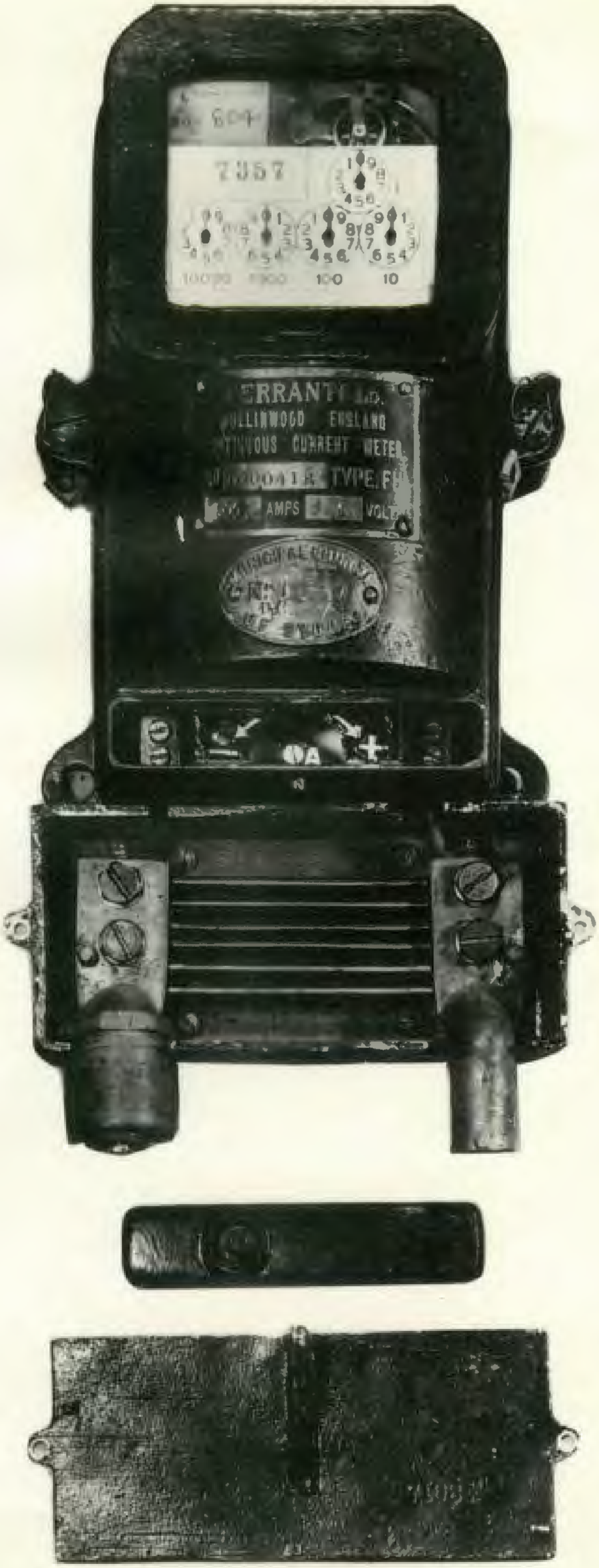

FIGURE I.

MERCURY MOTOR AMPERE HOUR DIRECT CURRENT METER WITH SHUNT ATTACHED

(Amdt. No.3 20-4-64)

SECTION 4

ALTERNATING CURRENT METERS

Single Phase A.C. Induction Type Meter Page 1
    Description Page 1
    Types Page 1
    Creeping Page 2
    Connections, Single and Two Rates Page 2
    Mounting Page 2
Polyphase A.C. Induction Type Meter Page 4
    Description Page 4
    Connections Page 4
    Mounting Page 5
Reserved for Future use Page 6-11
Polyphase A.C. Induction Type Combined Energy - kW Demand Meter Page 12
    General Description Page 12
    Siemens Schuckert Page 12
    Landis and Gyr Page 13
    Connections Page 14
    Reading and Resetting Page 14
    Mounting Page 14

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Superseding Introductory page issued June, 1963

SINGLE PHASE A.C. INDUCTION TYPE METER

(Figures 1 and 2)

Description

The essential parts of a typical single phase kilowatt-hour meter are as follows:-

(a) A current coil, wound in two sections on a laminated iron core forming an electro magnet.

(b) A voltage or potential coil wound on a laminated iron core forming an electromagnet.

(c) An aluminium disc free to rotate.

(d) A permanent magnet or magnets.

(e) A register to record the revolutions of the disc and to indicate the kilowatt-hours consumed.

The current coils are wound with a small number of turns of a heavy gauge wire, as they are in series with the line and, with whole current metering, carry the entire load current. With current transformer meters, the current coils carry the secondary current only. The full load secondary current of the current transformer is normally 5 amps., and the meter used in this circuit has a full load rating of 5 amps.

The voltage or potential coil is connected across the line, is wound with a large number of turns of a small gauge wire and is a highly inductive circuit.

When installed for whole current metering, the potential coil takes supply through a link from the line terminal of the meter to the neutral conductor connected to the No. 2 terminal. When used with C.T's the link is removed and the potential coil is arranged to be supplied from an external circuit. (See Section 25, circuit diagram 9).

Types

The meters generally used by the Council are the BAZ., H.M.T., and WF2 types, housed in synthetic moulded cases. Some older type meters, EMC, AZ, etc., are housed in metal cases. These meters are single phase, two wire types in which the voltage or potential coils are connected between each phase and neutral.

The BAZ type meter is available with either a single or dual register. (See figures 1 and 2).

Creeping

The creeping of a meter may be defined as the continuous rotation of a meter disc without the passing of a load current, and is due to an abnormal condition or adjustment. Creep can be either in a forward or a reverse direction, but the disc must make one complete revolution before the meter is said to be creeping. Meters which are used in conjunction with current transformers are more susceptible to creep as the current coil forms a closed circuit with the secondary of the CT.

In order to prevent the meter creeping, the disc is provided with two small holes, diametrically opposite. When either of these holes is near the pole of the potential coil, forces set up by the magnetic field tend to restrain the movement of the disc. Any meter found creeping must be reported through the officer's supervisor to the Meter Superintendent.

Connections

(a) Single Rate Meters

The terminals of these meters are unmarked and for ease of identification they are designated as one to four, from left to right. The connections are as shown in figure 1. All single phase, single rate meters must be connected accordingly.

(b) Two Rate or Dual Register Meters.

The single phase two rate meter is a BAZ type, but due to the size of the dual register and the register relay coil, it is mounted in a SD. type case as shown in figure 2.

The terminals are unmarked and for ease of identification they are designated from left to right in a similar manner to the SD. type polyphase meter i.e. 1 to 8 for the large terminals nearest the back of the meter, and 9 to 11 for the small terminals nearest the front of the meter. The connections are shown in figure 2, and all single phase two rate meters must be connected accordingly.

Mounting

The BAZ and HMT type meters must be securely mounted on the meter board with a 1" x 10 gauge round head wood screw in the top fixing lug, and two 1¼" x 7 gauge counter sunk wood screws in the base. The top fixing lug is so shaped that it will pass over and onto the screw.

The WF2 type meter has a metal fixing bracket at the rear of the case which is designed to fit over the head of the top fixing screw which shall be a ⅜" x 8 gauge round head wood screw, the bottom screws are of the same size as the BAZ and HMT type, i.e. 1¼" x 7 gauge countersunk wood screw.

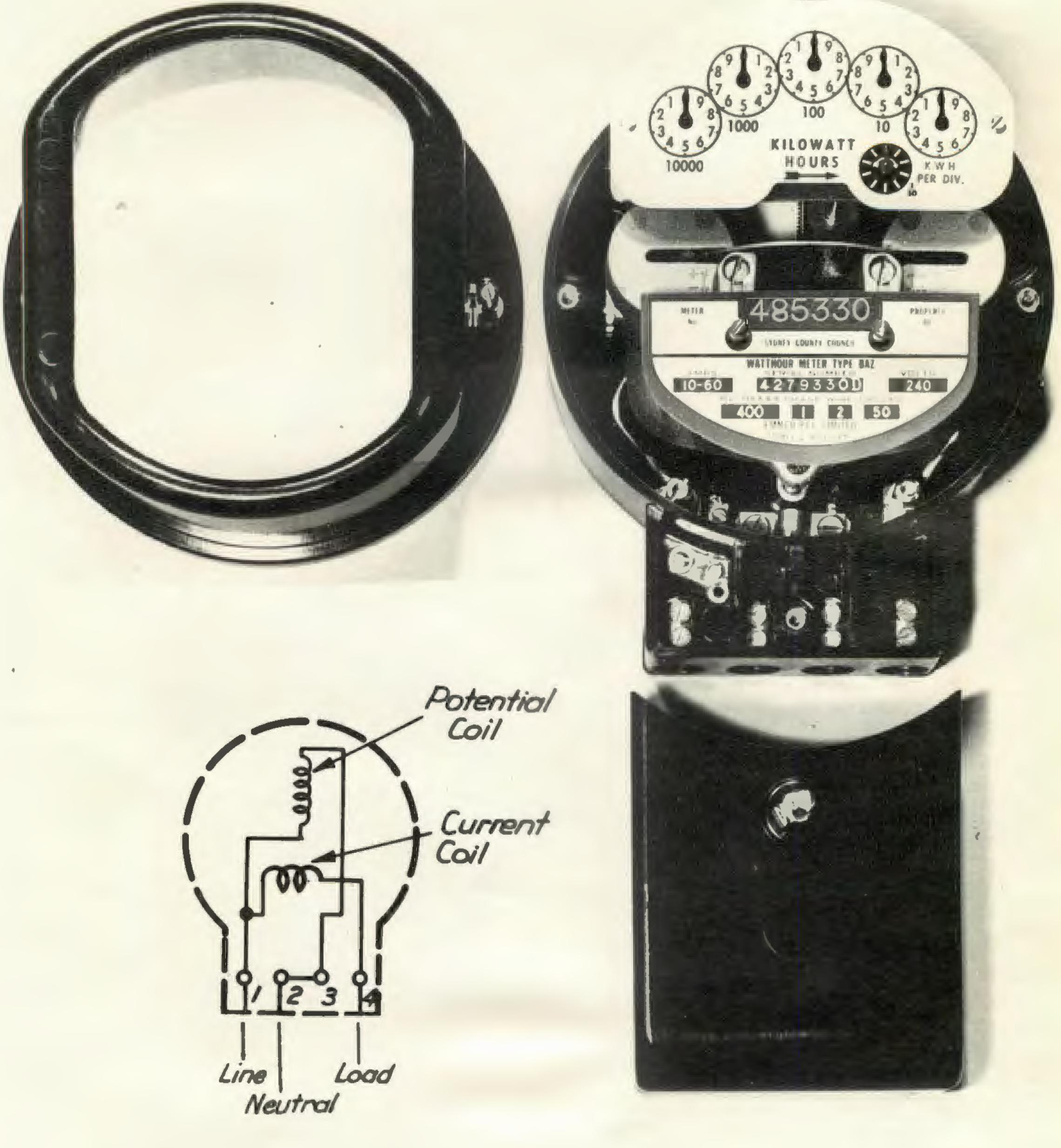


FIGURE 1.

A.C. INDUCTION METER, SINGLE PHASE 2 WIRE, BAZ TYPE AND CONNECTIONS

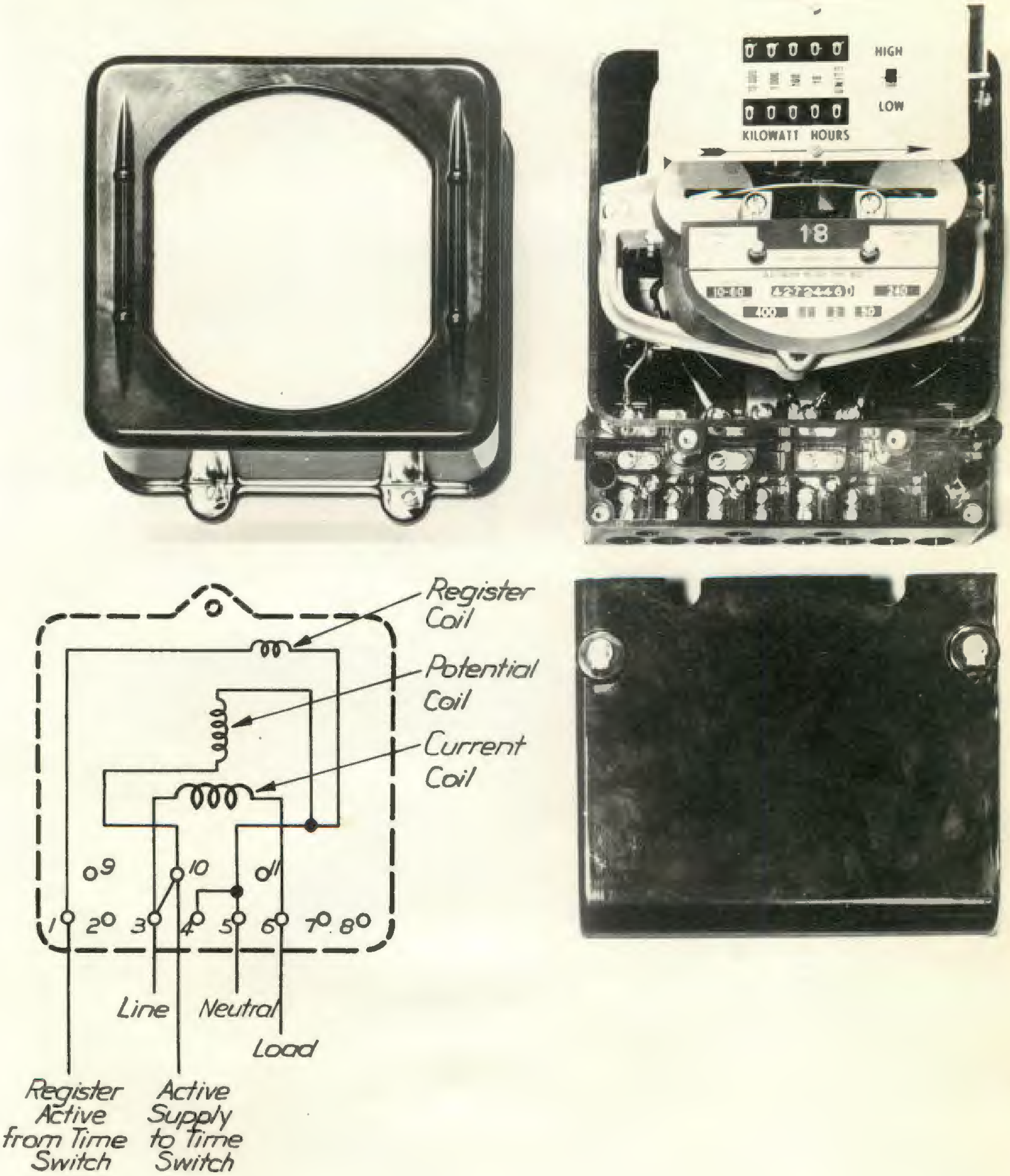


FIGURE 2.

2 RATE A.C. INDUCTION METER, SINGLE PHASE, 2 WIRE, BAZ TYPE AND CONNECTIONS

WOOD SCREWS.

The following is a list showing screws required and their size and purpose.

1 x 10 R.H.	Top of meter.
1¼ x 10	S. D. meters.
⅝ x 8	W. F. 2 meters (Warburton Franki)
1¼ x 7	Terminal Blocks of all meters.
3 x 10 P.K.	
Flat head Pointed	Fixing of Ring Type C T S.
1½ x 10 R.H.	Cleats supporting Bus Bars.
3 x 10	Batten.
2½ x 10	Meter Boards.

There are a number of various older type meters not covered in detail here as upon sight the method of mounting will be obvious. The top fixing screw in the metal clad meters will in most cases be a ⅝" x 8 gauge round head or 1¼" x 7 gauge counter sunk wood screws.

The BAZ two rate meter in the SD type case shall be mounted with a 1½" x 10 gauge round head wood screw in the top fixing lug and two 1¼" x 7 gauge counter sunk wood screws in the base in a similar manner to the SD type polyphase meter, although the clearance normally required either side of a polyphase meter is not needed in this case.

All meters shall be mounted on standard meter boards in a position not subject to vibration as shown in Section 14, however, in an existing installation where adequate space exists on a board, the meter may be fixed in that space providing the usual requirements of access etc., are available.

In all cases care must be taken to ensure that no part of the meter projects beyond the sides of the meter board.

POLYPHASE A.C. INDUCTION TYPE METER

(Figures 3, 4, 5 & 6)

Description

A polyphase meter comprises two or more complete single phase elements, normally operating on a common rotor spindle and register with usually one set of braking magnets.

Some older types of polyphase meters have a separate disc for each element, all being connected to one spindle. The type now more commonly used, and used by this Council, has a single disc, referred to as "S.D." The usual types for low voltage metering are:-

(a) A 4 wire three phase polyphase meter, in which the voltage coils are connected between each phase and neutral.

(b) A 3 wire two phase polyphase meter, in which the voltage coils are connected between each phase and neutral.

The accuracy of a polyphase meter is affected by the reversal of phase sequence which sets up interaction between the elements which is different from that set up when the correct phase sequence is applied, to which the meter has been tested and adjusted.

The accuracy is also affected if all potential coils are not energised and it must not be left connected in these circumstances.

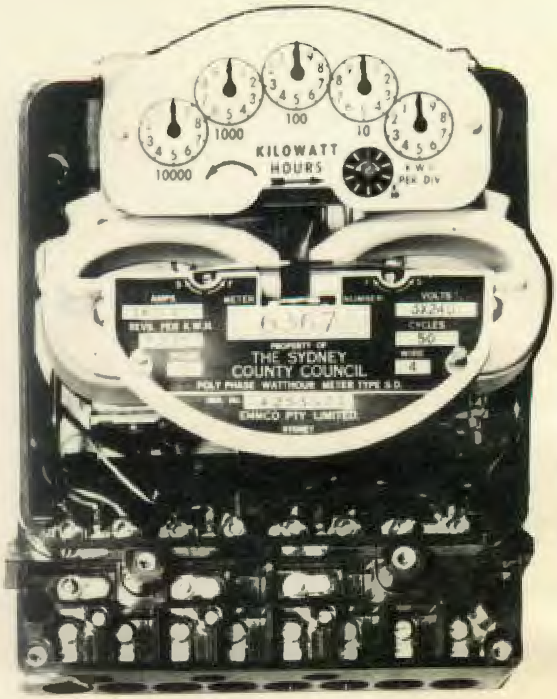
The Polyphase meters generally used by the Council are of the SD type, three phase, 4 wire; and two phase 3 wire, in which the potential coils are connected between each phase and neutral, available with either single or two rate registers and housed in synthetic moulded cases.

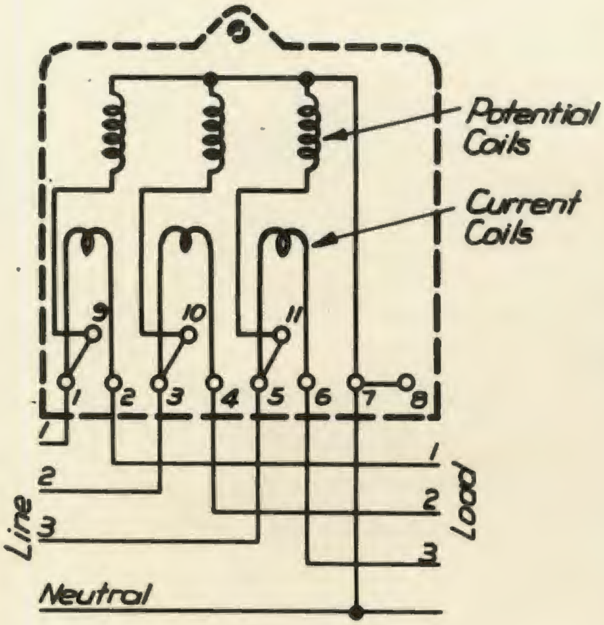
When a polyphase meter is installed for whole current metering, the potential coils take supply through a link from the line terminals of the respective phases to the neutral conductor connected to the No. 7 terminal. When used in conjunction with current transformers, the links are removed prior to issue, the potential coils then taking supply from an external circuit. (See Section 25, Circuit Diagram 8).

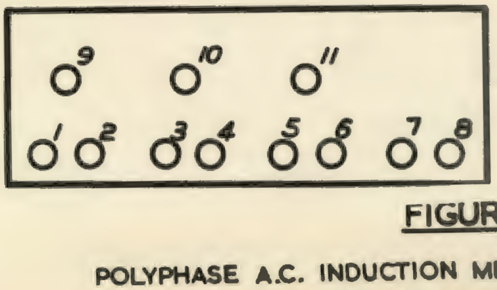
Connections

The terminals of the above meters are unmarked and for ease of identification they are designated from left to right; 1 to 8 for the large terminals nearest the back of the meter, and 9 to 11 left to right for the small terminals nearest the front of the meter. The connections are shown in figures 3, 4, 5 and 6, and all polyphase meters must be connected accordingly.

It will be noticed that the bridge, which is normally connected between terminals 7 and 8 has been removed in the two rate meter, the register relay active conductor then being connected to terminal 8.







End plan of meter terminal block showing cable entries

FIGURE 3.

POLYPHASE A.C. INDUCTION METER, 3 PHASE, 4 WIRE, SD TYPE AND CONNECTIONS

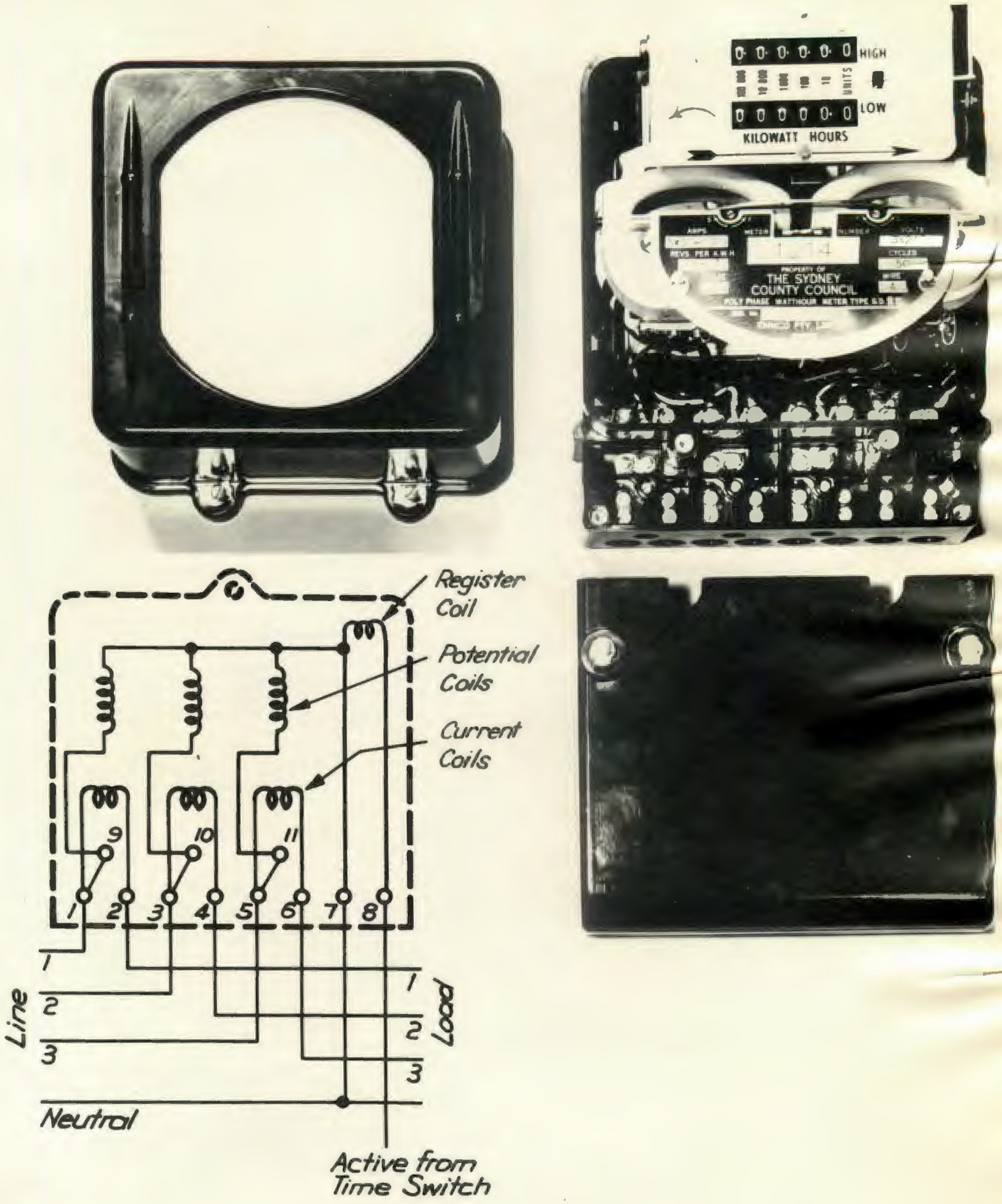


FIGURE 4.

POLYPHASE, TWO RATE. A.C. INDUCTION METER, 3 PHASE, 4 WIRE. SD TYPE AND CONNECTIONS

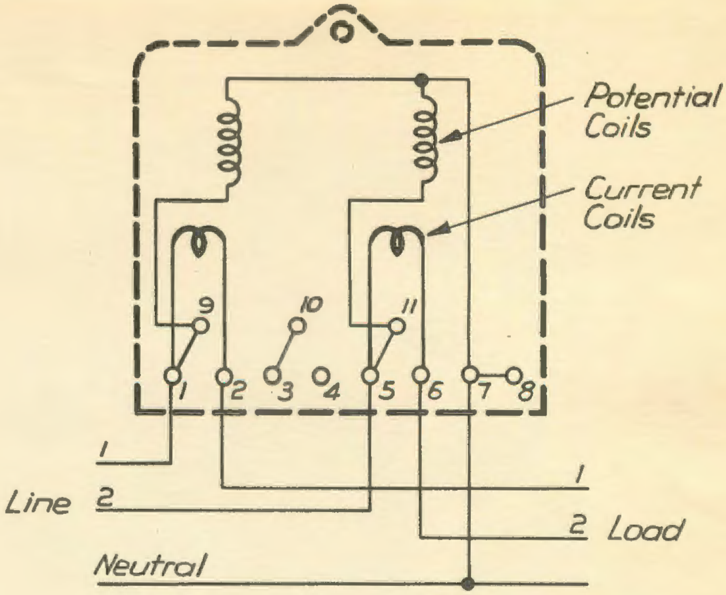


FIGURE 5

POLYPHASE A.C. INDUCTION METER, 2 PHASE, 3 WIRE, SD TYPE AND CONNECTIONS

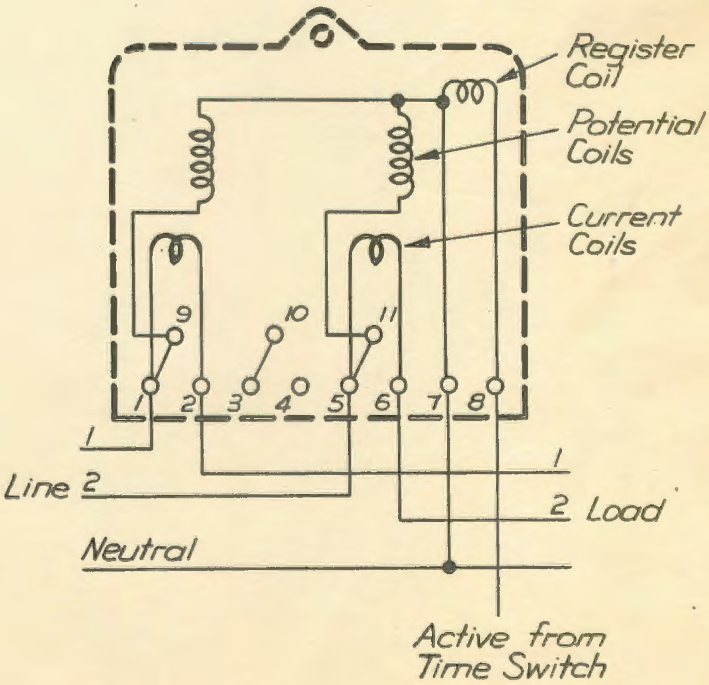


FIGURE 6

POLYPHASE TWO RATE A.C. INDUCTION METER, 2 PHASE, 3 WIRE, SD TYPE AND CONNECTIONS

SECTION 4
(Amdt. No.3 20-4-64)

POLYPHASE A.C. INDUCTION TYPE COMBINED ENERGY - kW DEMAND METER - (FIGURES 12, 13, 14, 15, 16 AND 17)

GENERAL DESCRIPTION

Meters from two different manufacturers are used, viz. Siemens Schuckert and Landis and Gyr, however the principles of operation are basically the same.

A polyphase combined energy - kW demand meter is essentially a kWh meter comprising three complete single phase elements operating on a common rotor spindle with either two or three discs, to which is added a demand mechanism which averages the power demand in kW during each 30 minute period.

The maximum demand mechanism is actuated from the rotor spindle and the number of rotor revolutions during each 30 minute period is transmitted in small steps to a two part lost motion or "memory" gear train. At the same time, the kW demand is indicated by an "idle" pointer which is driven around a graduated circular scale on the meter dial plate by an "active" pointer. It is important to note that the pointer on the graduated scale gives an approximate indication of the demand and is not used for accounting purposes.

At the end of the 30 minute integrating period, which is in most cases determined by a built-in synchronous motor, the maximum demand mechanism is disengaged and the active pointer and first part of the lost motion gear is reset to zero while the idle pointer and the second part of the lost motion gear remain in the position reached.

During the next integration period, the active pointer is moved around the scale and the first part of the lost motion gear is again turned. This procedure is repeated each 30 minute period. The "idle" demand pointer and the second part of the lost motion gear will only turn to a further position if a new demand exceeds any preceeding demand.

To determine the maximum kW demand for accounting purposes, a reset lever is operated which causes the second part of the lost motion gear to return to its zero position and in so doing, transmits the stored demand to a cyclometer type register. This operation also resets both the active and idle demand pointers to zero.

The kW demand register is cumulative, therefore, the maximum demand over any given period is the difference between the last and present readings, taking into consideration any reset which may have occurred during the reading period.

Siemens Schuckert Meters.

The types and sizes of Siemens Schuckert meters are as follows:-

METERING INSTRUCTION BOOK - TION 4
Additional pages 6 to 14 to be inserted after figure 6.

(a) Siemens Schuckert Energy-Demand Meter (SS/ED)

This is a single rate meter available with a rating of 5 amps. for use with C.T's only or with ratings of 10/40, 20/80 and 30/120 amps. for whole current metering.

(b) Siemens Schuckert Two Rate Energy-Demand Meter (SS/ED.2R)

This is a two rate meter available with a rating of 5 amps. for use with C.T's only or with a rating of 20/80 amps. for whole current metering.

The Siemens Schuckert meter is fitted with a synchronous motor which determines the 30 minute integration period and also acts as a servo motor to drive and reset the demand mechanism.

A demand coil, when energised, engages the demand mechanism and in the single rate meter an external bridge is connected to the terminal block by the Meter Branch to maintain the coil in an energised state.

In the two rate meter the bridge is removed and the coil is controlled by an external time switch so that the demand mechanism will not function when kWh consumption is being registered in the "low" rate position.

A register coil, when energised, engages the "high" register of the two rate meter and is also controlled by an external time switch.

It will be seen from the circuit diagrams (Nos. 12 and 15) that the common NEUTRAL conductor from both of these coils is controlled by the one time switch. That is the switching is done in the neutral conductor.

Where two 2 rate meters are installed for one customer, the register coils may be controlled with one time switch as shown in Section 25.

Landis and Gyr Meters

The types and sizes of Landis and Gyr meters are as follows :-

(a) Landis and Gyr Energy Demand Meter (LG/ED)

This is a single rate meter available in a rating of 5 amps. for use with C.T's only.

(b) Landis and Gyr Two Rate Energy Demand Meter (LG/ED.2R)

This is a two rate meter available in a rating of 5 amps. for use with C.T's only.

The Landis and Gyr single rate meter is fitted with a synchronous motor which determines the 30 minute integration period only. The demand mechanism is engaged continuously and is driven by the rotor spindle. The reset mechanism is spring operated.

METERING INSTRUCTION BOOK - SECTION 4
Additional pages 6 to 14 to be inserted after figure 6.

The integration period of the two rate meter is controlled by an external time switch which also energises the two rate register coil for the "high" rate position. The time switch is of Landis and Gyr manufacture and is designed with two switching operations specifically for use with the LG/ED.2R meter (The time switch is known as type LG2RD).

As with the SS/ED.2R type meter, the time switch also opens and closes the neutral conductor but in this case a neutral conductor is taken from each coil which is separately switched.

Where two 2 rate meters are installed for one customer, the register coils may be controlled with one time switch as shown in Section 25.

Connections

The circuit diagrams showing the connections for all types of energy demand meters are shown in figures 12 to 17 in this section and in the appropriate diagrams in Section 25.

An earthing terminal is provided on the metal case of most energy-demand meters, but this must not be used as Council's metering equipment is not earthed.

When four terminal time switches are used, the active supply to the motor must, where practicable, be taken from a point on the line side of any switch which could disrupt supply to the time switch. (See the circuit diagrams in Section 25).

The methods and procedures for connection must be followed as specified in Section 10, "Whole Current Metering" or Section 11, "Connection of Current Transformers and Current Transformer Metering" as applicable.

Meter Reading and Reset Procedures

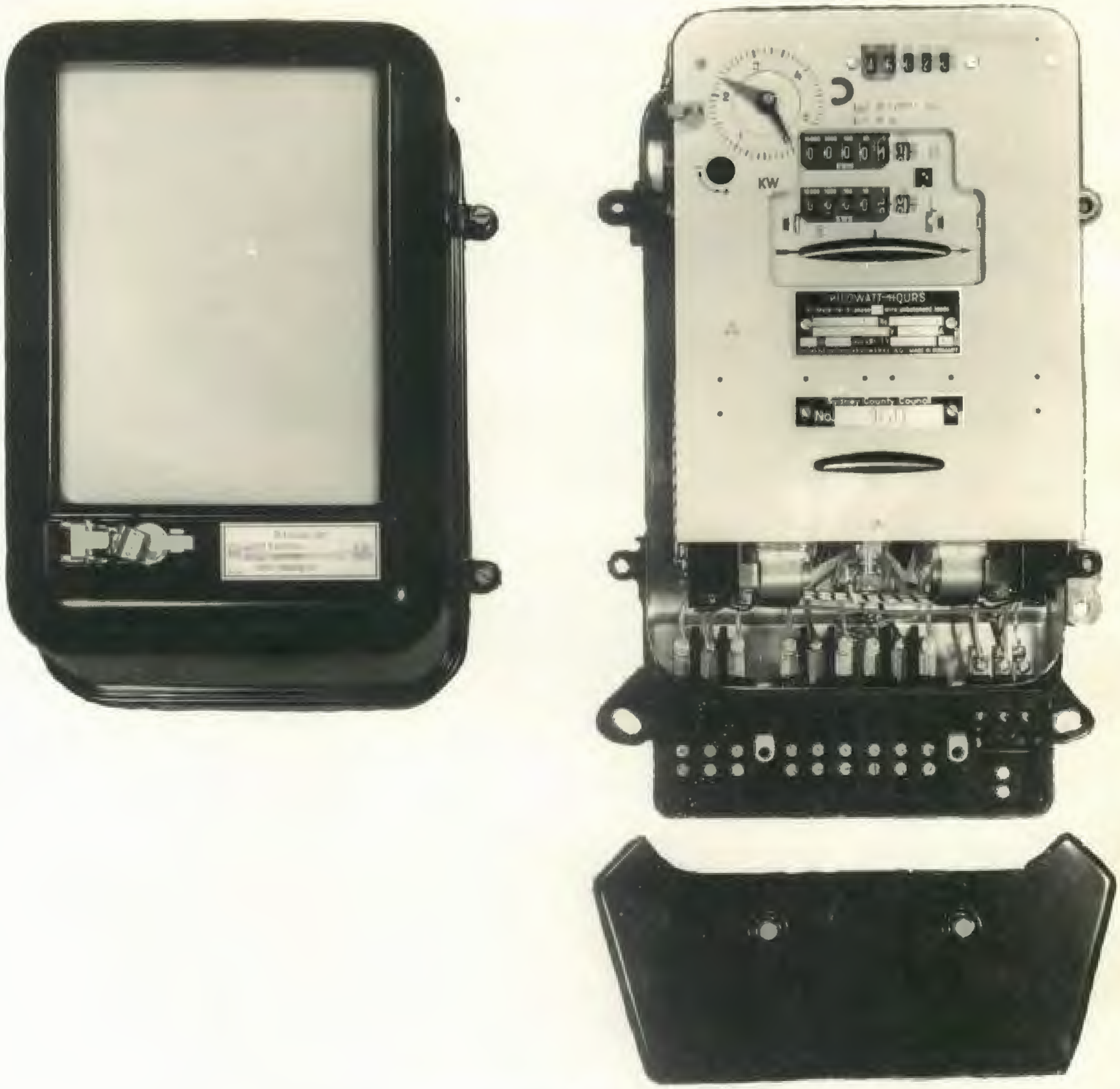
The methods to be used in reading and resetting Energy Demand Meters are given in Section 2, "Meter Reading".

Mounting of Energy Demand Meters

These meters must be securely mounted on the meter board, in a position free from vibration, with three 5/8" x 8 gauge round head wood screws through the pressed metal mounting feet.

To give access to adjustments mounted in the side of the meter, a clearance of two inches (2") must be maintained between the meters and any other instrument or obstruction which extends beyond the rear section of the meter case mounted on the board.

Meters shall be mounted on an 18" x 21" wide board as shown in Figure 5, Section 11, however, in an existing installation where adequate space exists on a board, the meter may be mounted in that space providing the usual requirements of access etc. are available.



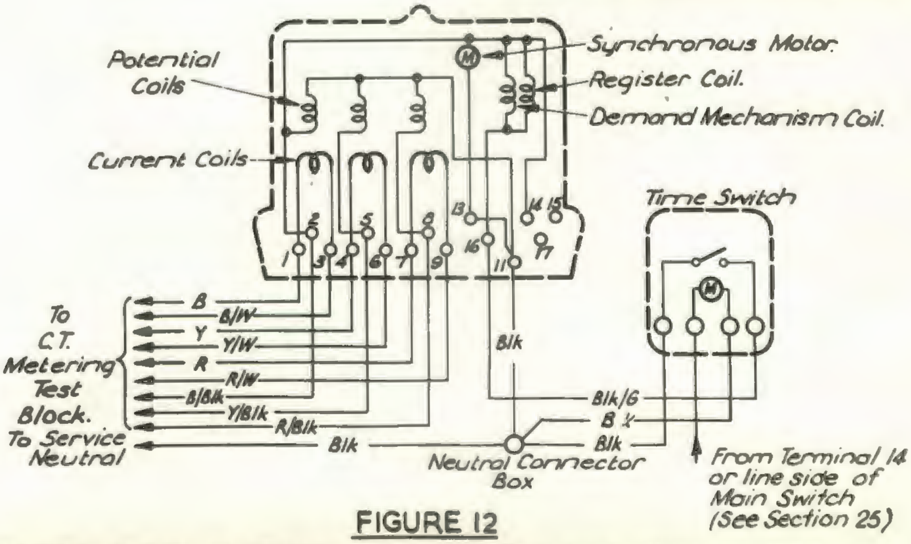


FIGURE 12

COMBINED ENERGY - KW DEMAND C.T. CONNECTED 2 RATE INDUCTION METER
A.C., 3 PHASE, 4 WIRE, SS/ED. 2R TYPE AND CONNECTIONS.

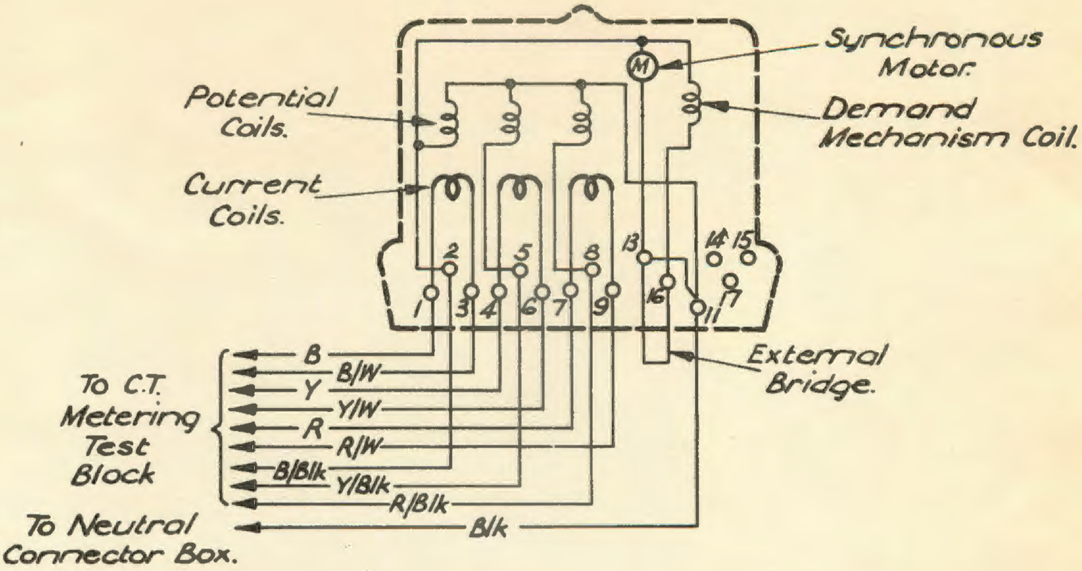


FIGURE 13

COMBINED ENERGY – KW DEMAND C.T. CONNECTED INDUCTION METER A.C., 3 PHASE, 4 WIRE, SS/ED TYPE & CONNECTIONS.

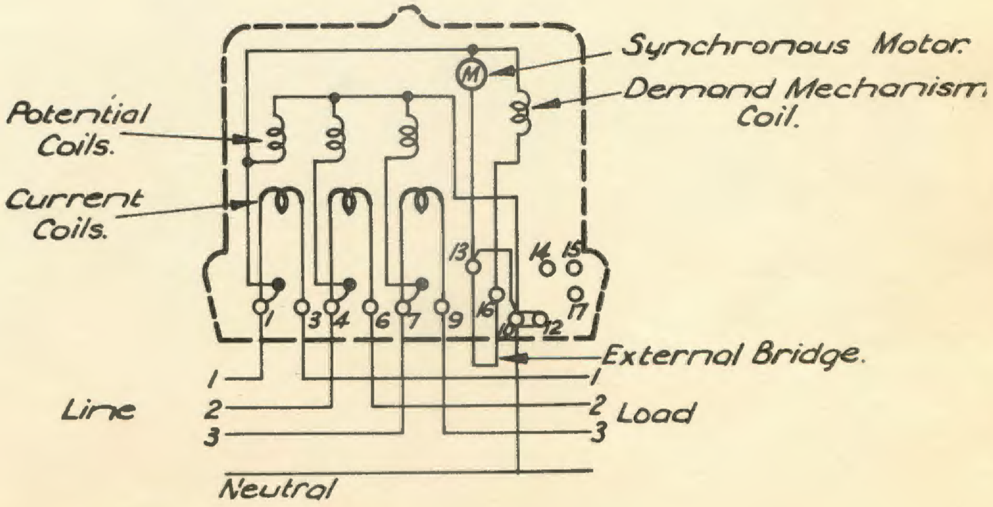
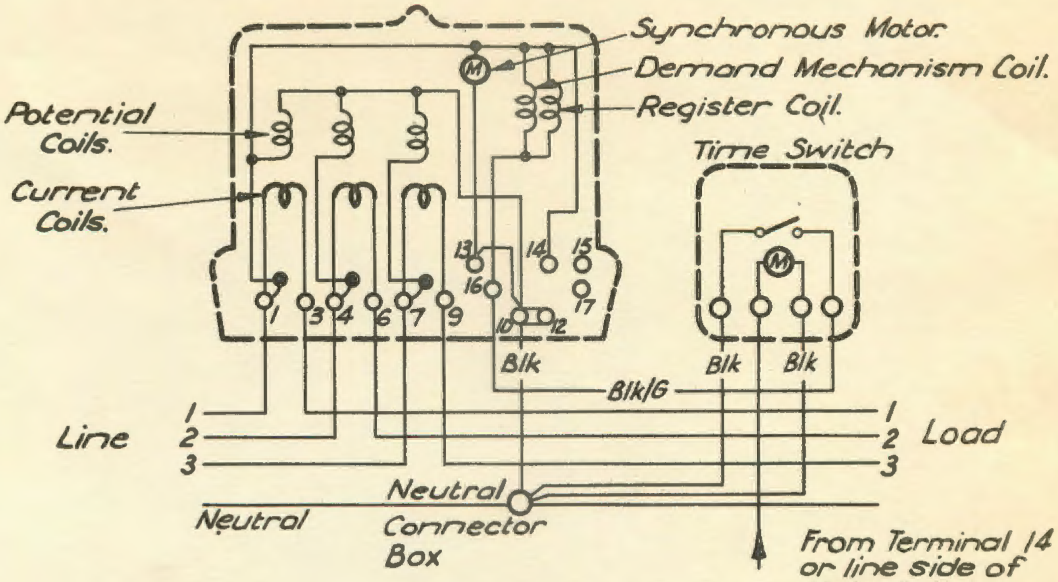


FIGURE 14

COMBINED ENERGY– KW DEMAND WHOLE CURRENT INDUCTION METER A.C., 3 PHASE, 4 WIRE, SS/ED TYPE AND CONNECTIONS.



From Terminal 14
or line side of
Main Switch
(See Section 25)

FIGURE 15

COMBINED ENERGY–KW DEMAND WHOLE CURRENT 2 RATE INDUCTION METER
A.C.. 3 PHASE. 4 WIRE. SS/ED.2R TYPE AND CONNECTIONS.

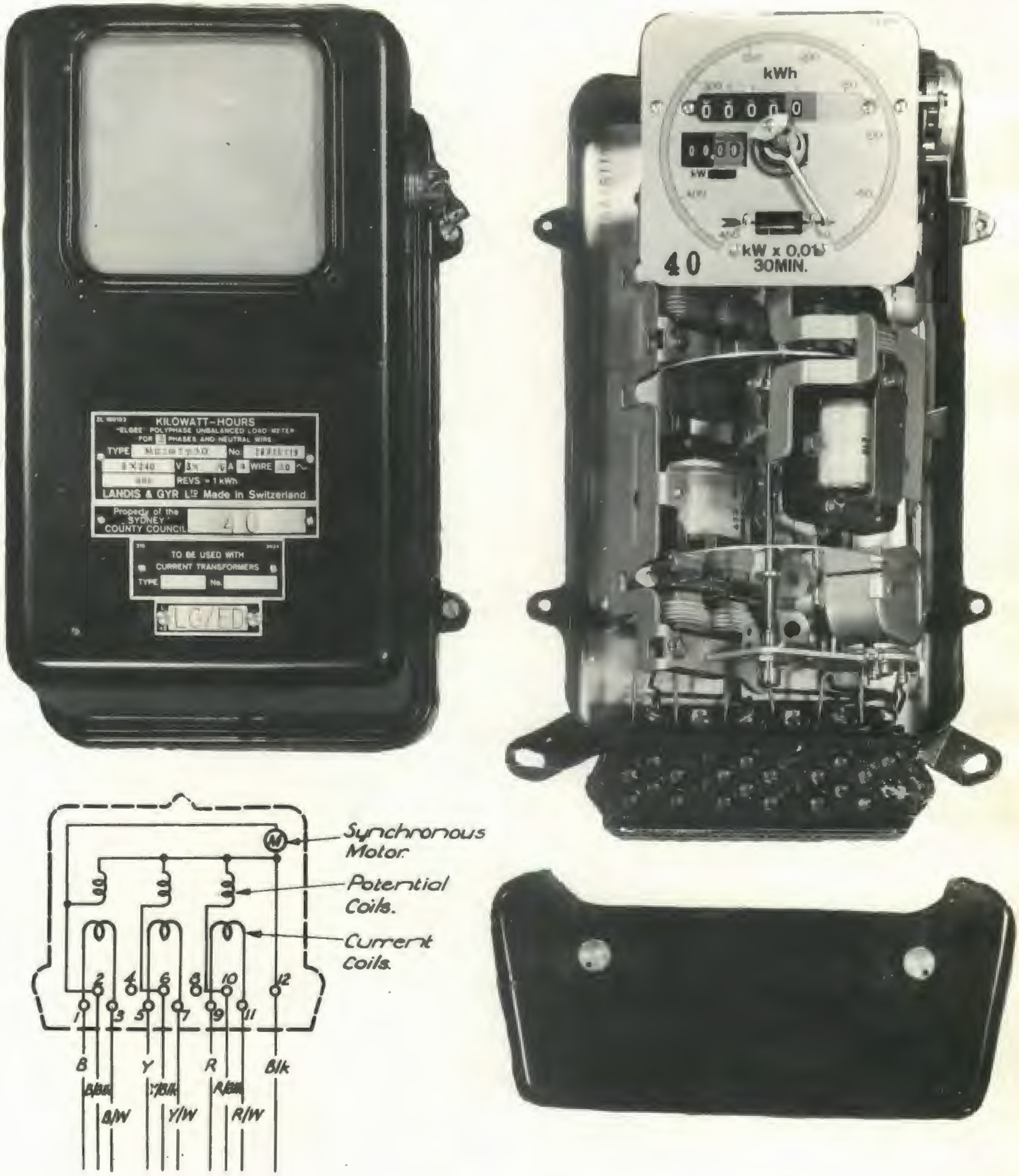

KILOWATT-HOURS
"ELGEE" POLYPHASE UNBALANCED LOAD METER
FOR 3 PHASES AND NEUTRAL WIRE
TYPE
No.
V
A
WIRE
REVS = 1 kWh
LANDIS & GYR Lᵀᴰ Made in Switzerland
Property of the SYDNEY COUNTY COUNCIL
40
TO BE USED WITH CURRENT TRANSFORMERS
TYPE
No.
LG/ED
kWh
kW
40
kW x 0,01
30MIN.
M
Synchronous Motor
Potential Coils.
Current Coils.
1
2
3
4
5
6
7
8
9
10
11
12
B
Y
R
Blk
B/Blk
B/W
Y/Blk
Y/W
R/Blk
R/W

FIGURE 16

COMBINED ENERGY— KW DEMAND C.T. CONNECTED INDUCTION METER A.C., 3 PHASE, 4 WIRE, LG/ED TYPE & CONNECTIONS

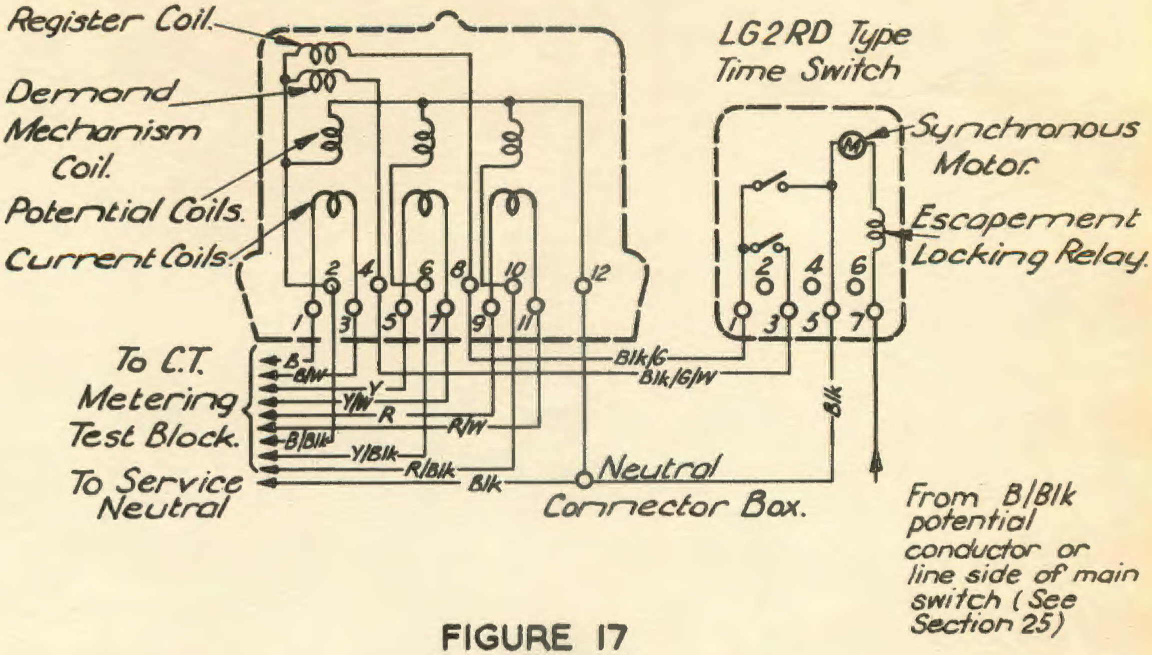


FIGURE 17

COMBINED ENERGY-KW DEMAND C.T. CONNECTED 2 RATE INDUCTION METER
A.C., 3 PHASE, 4 WIRE, LG/ED. 2R TYPE & CONNECTIONS.

SECTION 5

MAXIMUM DEMAND INDICATORS.

Description of, Wright or Reason Ampere Demand Indicator. Page 1.

Lincoln Ampere Demand Indicator. Page 1.

Types and Sizes. Page 2.

Connections. Page 3.

Mounting. Page 3.

MAXIMUM DEMAND INDICATORS

(Thermal Type)

Description

1. Wright or Reason Ampere Demand Indicator. (figure 1)

This indicator consists of two glass bulbs connected by a glass U tube, which is filled with sulphuric acid. Another glass tube called the index tube, to which the ampere scale is attached, is teed off the U tube at its connection to one of the bulbs. The other bulb has wound upon it a heating coil, through which the current passes. As both bulbs are filled with air, changes in ambient temperature affect both alike, and so the column of liquid is not affected by such changes in temperature. When current flows, it heats the heating strip, which raises the temperature of the air in the bulb on which it is wound, and the expanding air displaces the liquid in the U tube. When the liquid reaches the index tube, a certain quantity of it, depending upon the current flowing, falls into the tube.

The amount of liquid in the index tube, which can be read from the ampere scale, is a measure of the demand. The expansion of the air in the heated bulb is proportional to the temperature to which it is raised and is thus proportional to the square of the current flowing. The requisite time lag of this instrument is obtained by capillary restrictions in the glass U tube, and each meter of this type requires its own individual scale. Resetting is carried out by tipping the glass tubes so that the liquid in the index tube returns into the U tube.

2. Lincoln Ampere Demand Indicator. (figure 2)

The essential parts of this ampere demand indicator consist of,

(a) Two bi-metalic coils, each enclosed in a bakelite cylinder.

(b) Heating element.

(c) Spindle.

(d) Active pointer (red).

(e) Idle pointer (black).

(f) Scale marked in amperes. In some instances the scale is also marked in kilowatts assuming constant voltage.

The two bi-metallic coils, which are enclosed in metal or bakelite cylinders, have their outer ends rigidly attached to the sides of the cylinders. The inner ends of the coils are attached to the spindle, to which is attached the red coloured active pointer. The coils are arranged in such a manner that the action of one is opposed to that of the other.

These coils are made up of two metals, brass and a steel alloy, which are welded together. Due to the different expansion coefficients of these two metals, the heated coil tends to unwind with a rise in temperature (which is produced through the current in the heating element), and in so doing, turns the spindle which actuates the active pointer. The idle pointer which is coloured black is moved across the scale by the active pointer and thus it indicates the maximum demand recorded at any time. If the current is switches off, the reverse action takes place and in so doing moves the active pointer down the scale. The idle pointer remains at its maximum position. The coils are arranged in such a manner that the unheated coil compensates for ambient temperature rise and thus the accuracy of the indicator is not affected by variations in the ambient temperature.

A time lag is obtained by suitable design of the cylinders and coil, and depends upon their heat capacity.

The indicator is fitted with a resetting device shown as "A" in figure 2 which can be operated without removing the cover. This device is a spring wire which engages with the idle pointer. It is operated by a small lever. It is not possible to set the idle pointer below the point at which the active pointer registers when current is flowing.

In installations with a large demand, a L.R. type indicator is usually used (figure 3). This indicator has the advantage of a finer reading scale, being calibrated every .05 of an ampere against the L. type which is calibrated every .1 of an ampere. Both instruments are similar in other respects.

Type & Sizes

The indicators generally used by the Council are the Lincoln and Lincoln R. types. (figures 2 and 3). The Reason and other older types are not now being issued and very few will be found still connected.

An indicator must be chosen so that the pointer is approximately on half scale when the installation is drawing normal current.

Indicators are available in the following sizes:-

M.D.I./L. (for whole current connections)

5 ampere
10 "
15 "
25 "
40 ampere
50 "
80 "
100 "

M.D.I./L and M.D.I./LR (5 ampere indicators with a reading constant for CT metering) See Section 2 "Reading Constants".

100/5 ampere
150/5 "
200/5 "
300/5 "
400/5 "
500/5 "
600/5 "
800/5 ampere
1000/5 "
1200/5 "
1500/5 "
2000/5 "
2500/5 "
3000/5 "

Connections

Maximum Demand Indicators shall be connected in series with the load conductor between the meter (or polyphase meter element) and the customers switchboard for whole current metering, and in the "non-polarity" conductor between the meter and testing block for C.T. metering.

The accuracy of the instrument is not affected whichever side the line connection is made, but for the sake of uniformity, the line side must always be made the left hand terminal.

Before commencing work on any M.D.I. and before leaving a job after having connected an M.D.I., the metal case must be checked with a test lamp to ensure that it is not "alive". Where an M.D.I. is found "alive", it shall not be left connected. The conductors must be joined either in a link or by binding together with sealing wire and taping, and the indicator returned to the Meter Branch store as defective. The officer shall report the facts to his supervisor who will arrange for a replacement.

A tag must be attached to each indicator showing the number of the meter with which it is connected in circuit. Naturally with a polyphase meter the same number will appear on each tag. (See Section 13, "Sealing and Labelling").

See also B.S.I. No. 39 Index No. 304.2, for the method of recording details of indicators fixed.

Mounting

The M.D.I./L type must be mounted securely on the meter board with one 1" x 10 gauge round head wood screw in the top fixing lug, and one 1" x 10 gauge counter sunk wood screw in the base.

The M.D.I./LR type has a recess in the back of the case designed to fit over the top fixing screw which shall be a $\frac{5}{8}$" x 8 gauge round head wood screw, the base being secured with two $\frac{3}{4}$" x 8 gauge counter sunk wood screws.

Spacing between indicators mounted alongside one another is not required but they must not be actually touching.

All indicators must be mounted on standard meter boards in a position not subject to vibration in a similar manner to other meters (See Section 14) except that the height from the floor must not exceed 6 feet so that the demand may be read without difficulty, and where ever practicable they shall be installed below their corresponding meters. In an existing installation, where adequate space exists on the board, the indicator may be fixed in that space if it is within 6 feet of floor level and the usual requirements of access etc., are available.

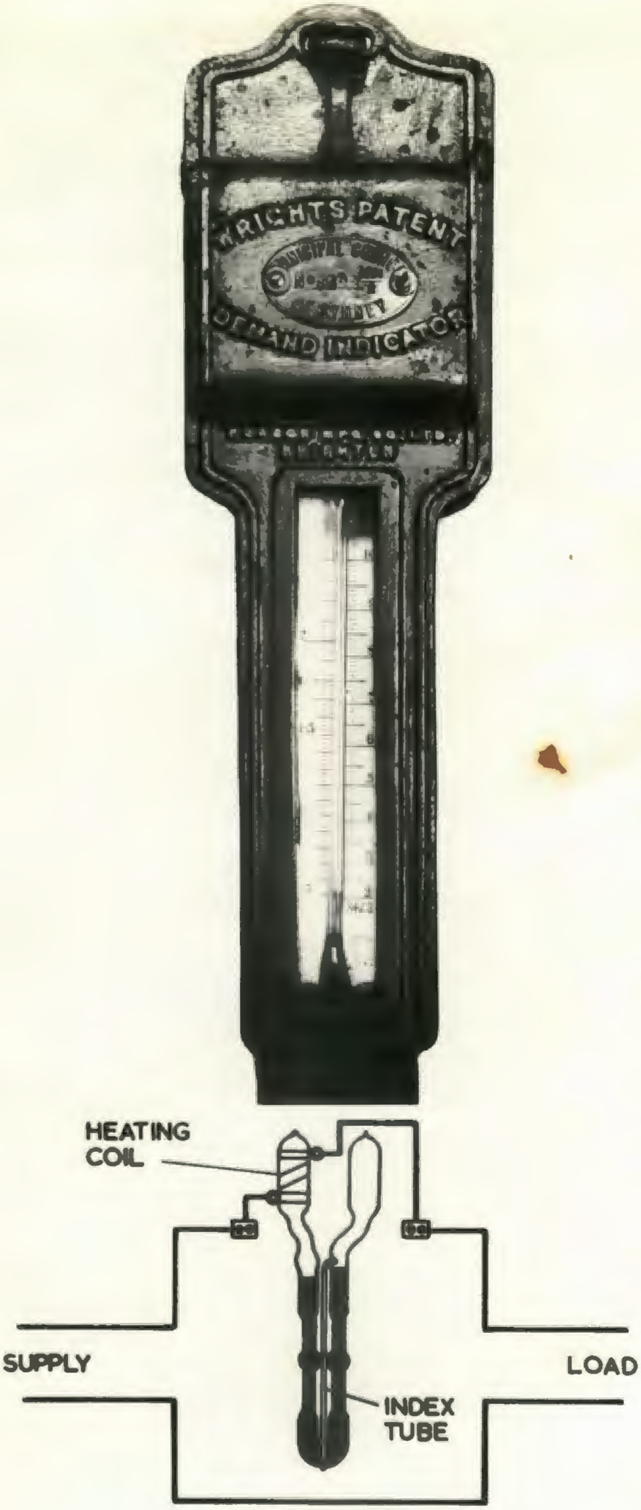


FIGURE 1.

WRIGHT OR REASON TYPE MAXIMUM DEMAND INDICATOR

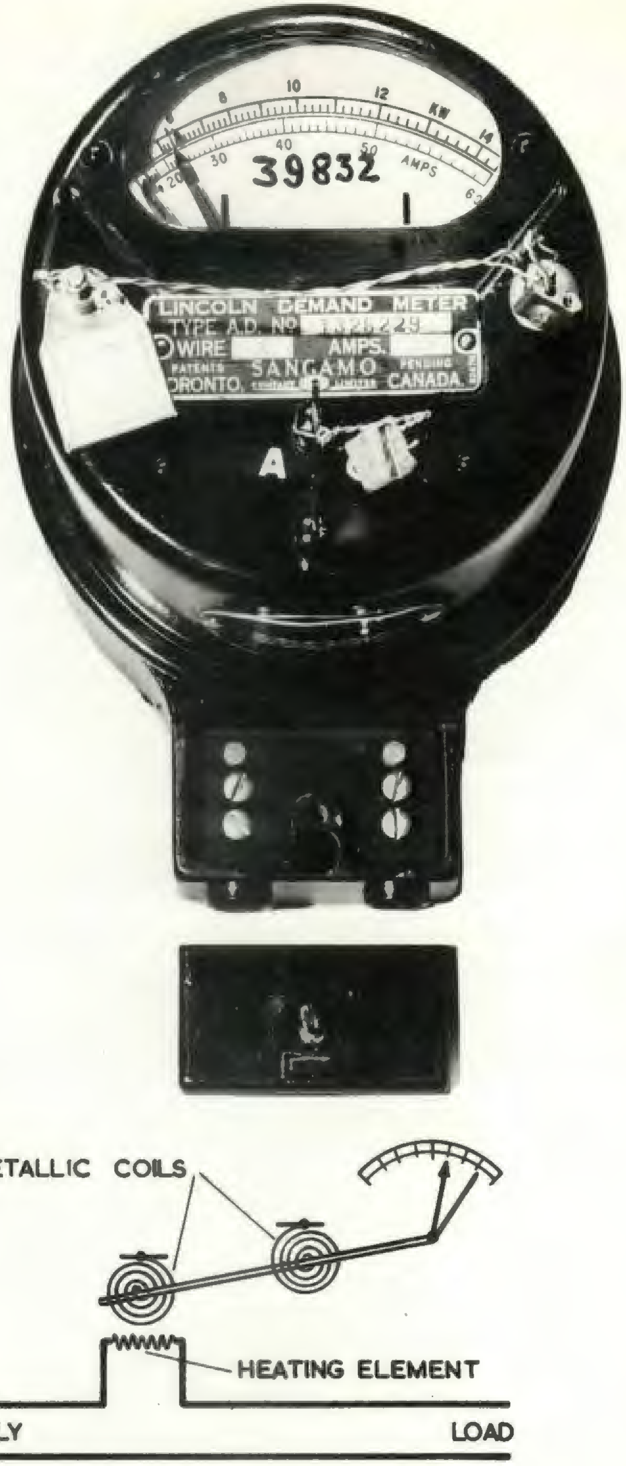


FIGURE 2.

LINCOLN TYPE MAXIMUM DEMAND INDICATOR (MDI/L)
SHOWING RESETTING LEVER "A"

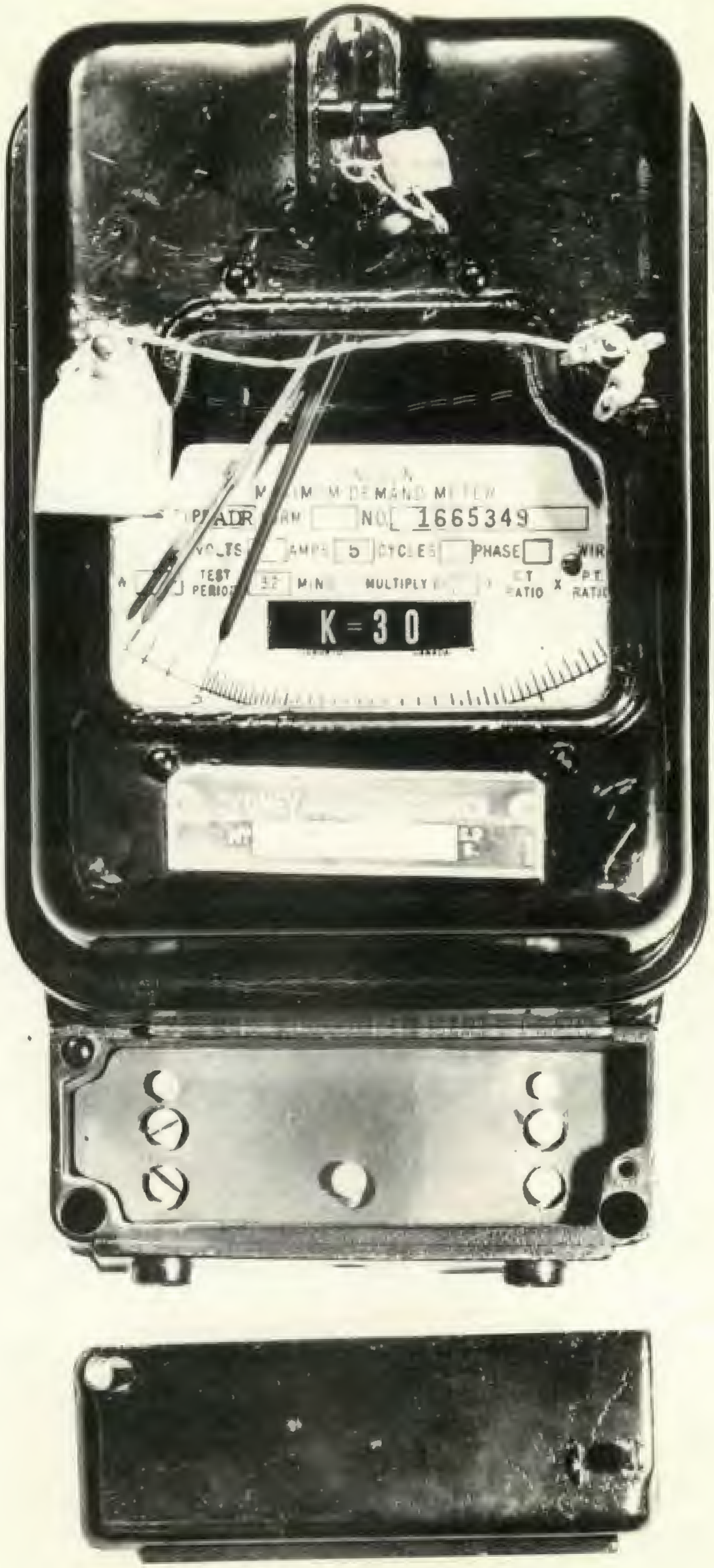
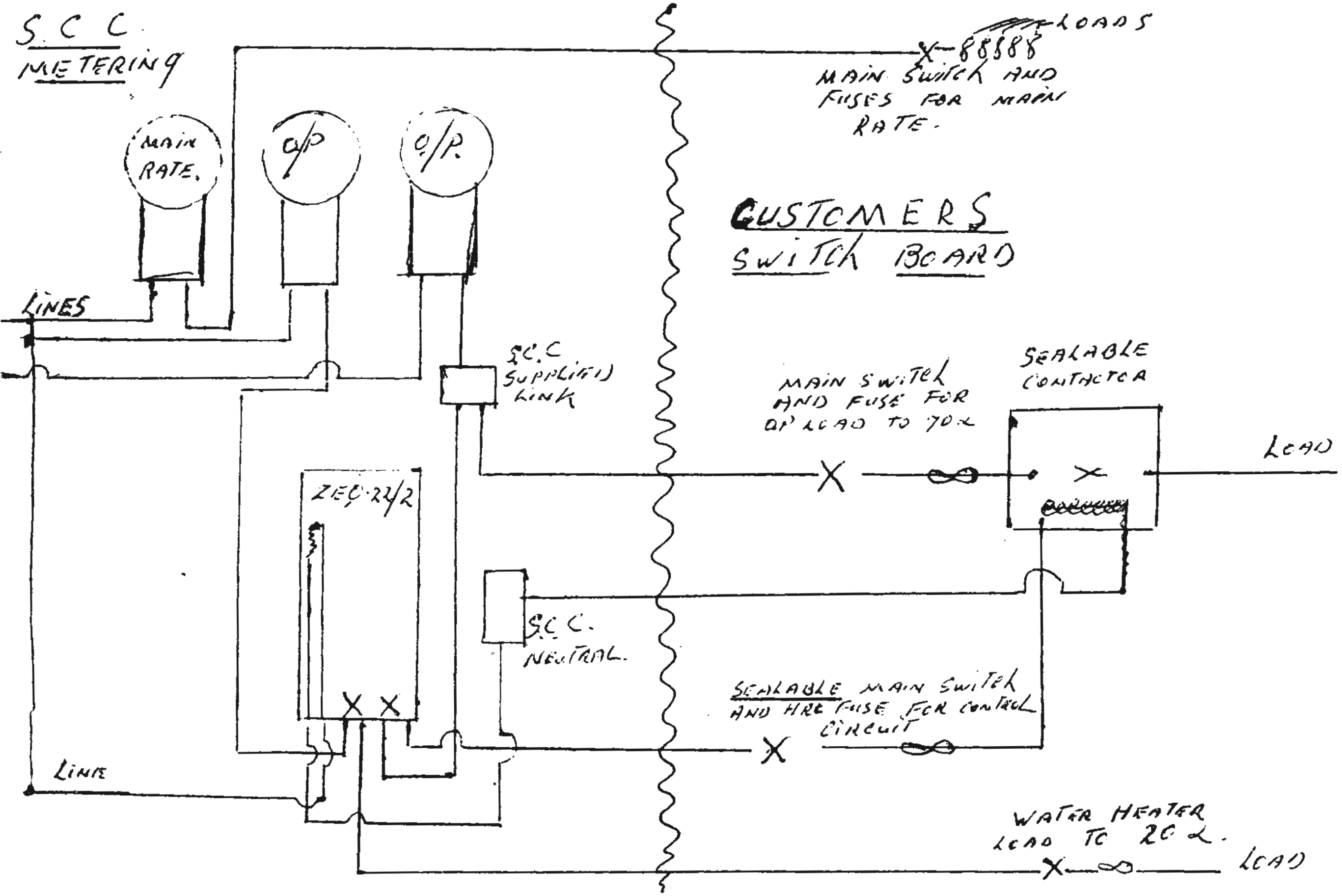


FIGURE 3.

MAXIMUM DEMAND INDICATOR TYPE LR (MDI/LR)

CONTROL OF OFF PEAK WHERE CONTACTOR IS NOT MOUNTED ADJACENT TO THE METERING.


S.C.C METERING
LOADS
MAIN RATE.
O/P
O/P.
MAIN SWITCH AND FUSES FOR MAIN RATE.
CUSTOMERS SWITCH BOARD
LINES
S.C.C SUPPLIED LINK
MAIN SWITCH AND FUSE FOR OP LOAD TO 70A
SEALABLE CONTACTOR
LOAD
ZEC 22/2
S.C.C. NEUTRAL.
SEALABLE MAIN SWITCH AND HRC FUSE FOR CONTROL CIRCUIT
LINK
WATER HEATER LOAD TO 20A.
LOAD

SECTION 6.

CURRENT TRANSFORMERS

Voltage and Current Transformers. Page 1.

Polarity of Current Transformers. Page 2.

Description & Installation of:

Ring or Tunnel Type, Encapsulated Multi Range Current Transformer Page 3.

Wound Primary Type, Single Range Current Transformer Page 6.

Tunnel Type Current Transformers other than the Encapsulated Type Page 7.

Ring Type Multi Range Current Transformer Page 9

INSTRUMENT TRANSFORMERS

Instrument transformers are used with alternating current instruments when high voltage or large currents have to be measured. They are of two types, voltage and current.

Voltage Transformers

Voltage or potential transformers are used for voltmeters or the potential coils of kilowatt hour meters and do not differ materially from the constant potential power transformer, except that their power rating is small. These transformers, within their rating, are designed to maintain an extremely accurate ratio between primary and secondary voltages. The standard secondary voltage for high voltage metering is 110 volts.

Potential transformers are used by this Council in high voltage metering and as this work is carried out by other Branches, they will not generally be dealt with by officers of the Installation Inspection Branch. For low voltage metering, the potential coil of the kilowatt hour meter is energised directly from the supply at 240 volts.

Current Transformer (C.T.)

Current transformers are used when the current to be measured is greater than can be carried by a meter connected directly into the circuit.

The C.T. has a primary winding which consists of a straight conductor passing through a ring or tunnel shaped laminated core, or, in the older type C.T's., a few turns only wound on an iron core. In each, the primary carries the full line current. The secondary consists of a number of turns wound on the ring or core.

C.T's are so designed that the secondary current is proportional to the line current. The standard maximum rating of a C.T. secondary winding is 5 amperes.

The secondary circuit of a C.T. must never be open circuited whilst the primary winding is energised as a high voltage will be induced which may damage the insulation or give a severe shock to the person working on it. When it is necessary to open the secondary circuit, (e.g. remove a meter) it must first be short circuited. This is usually done at the testing block, which is connected in the secondary circuit, by bridging the two terminals concerned. A piece of sealing wire bound around these terminals will suffice. Care must be taken to ensure that this connection is secure and that it is removed after the secondary circuit is closed. When bridging at the terminals of a multi-range C.T., any pair of secondary terminals may be used to short circuit the secondary winding, but where a common terminal exists, the bridge must be made if possible between the common terminal and a disused terminal so that it will not be interfered with whilst changing connections.

Polarity of Current Transformers (See "Terms Used in Meter Installations", Section 1)

The polarity of C.T's. is generally indicated by permanent white or yellow markings made adjacent to the primary and secondary terminals. The relative instantaneous direction of the currents will be into the marked primary terminal and out of the marked secondary terminal. The primary line connection of all Council C.T's. is always the polarity side.

When a C.T. is used with a kilowatt hour meter, the relative directions of the currents in the potential and current coils of the meter must be such as to produce a forward movement of the meter disc. For this reason, one potential coil and one current coil terminal are usually marked and connected to the correspondingly marked terminals of the potential and current transformers. The terminals of the meters used by the Council are not marked in this manner but it can be remembered that the left side terminal of both the potential and current coils of a meter is the "polarity" terminal. In any case when connecting meters, the appropriate circuit diagram must be followed.

RING OR TUNNEL TYPE ENCAPSULATED MULTI RANGE CURRENT TRANSFORMER

(Figure 1)

Description

The secondary windings and the laminations of this transformer are encapsulated in epoxy resin. They are of the three ratio type, available sizes being 150-300-600/5 amperes; 400-800-1200/5 amperes; and 1000-2000-3000/5 amperes. A circular tunnel for the primary conductors is provided in the centre of the two smaller transformers and a rectangular tunnel in the larger.

The secondary terminals are located under an insulated cover on the top of the transformer. The cover is fixed with two screws which are drilled for sealing. The cover is reversible lengthwise with a cable entry at one end. The secondary circuit conductors may be taken from either end to suit the location. There are four secondary terminals, one common and one for each tapping. The common terminal is marked "0" and each of the other three is marked with the primary current which, with that particular tapping in use will produce a secondary current of 5 amperes. Two $\frac{1}{4}$" diameter bolts with nuts and washers are provided for the connection of the secondary conductors to these terminals.

Yellow dots identify the polarity connections of the transformer. The primary marks are located on the face and end of the moulding and the secondary mark is located adjacent to the secondary common terminal.

The rating plate showing the current ratios and the S.C.C. number is moulded into the case on the polarity side. The S.C.C. number is also shown with the secondary terminal markings under the secondary terminal cover. Pressed metal mounting feet are fixed to the C.T. with bolts which pass through the moulding. Equi-distant holes are located in each corner of the transformer to enable the mounting feet to be fixed on any side. The feet must not be mounted on the top or secondary terminal side.

Installation

(a) Service Cabinet

Encapsulated ring or tunnel type C.T's., when mounted adjacent to the service cabinet, shall be fixed on a 12" x 21" wide board with four $\frac{3}{4}$" x 10 gauge self tapping screws and $\frac{1}{4}$" washers in the standard manner as shown in Figure 2. If these screws are not available, 1" x $\frac{1}{4}$" diameter metal thread screws, nuts and washers may be used.

In accordance with the Service Rules, the customer must erect soft wood battens 34" long x 3" x 2" upon which the Mains Branch will erect an 18" x 21" wide board and the service cabinet. A 4" x 21" wide fillet board and the 12" x 21" wide board are fixed in that order to the battens without the use of button insulators.

Standard insulated busbars are provided by the Council for connections to the cabinet phase terminals. The bars pass through the tunnel of the C.T. and are secured in a cleat below the transformers, leaving an exposed end with a ½" diameter clearance hole for the connection of the customers cables or bars. The cleat is a synthetic moulding and is fixed in position on the board, as shown, with two 1½" x 10 gauge round head wood screws. The bars are coloured red, yellow and blue and must be installed in that order from left to right. The bolts, nuts, lugs and insulation used for "load" connections to these bars must be provided and installed by the customer. One conductor only may be connected to the end of each bar. Parallel conductors terminating in the one lug are deemed to be one conductor. However, a cable of a size not greater than 7/.064 may be connected to one of the tapped holes in each bar within the cabinet for a separate whole current metered portion of the installation. (See figure 2).

Where more than one set of C.T's are to be connected to the one cabinet, the customer must provide all connections. A typical example is shown in figure 3. No objection will be raised to the customer arranging to connect one cable per phase not greater than 7/.064 within the cabinet in a similar manner to that used with the standard bars shown in figure 2.

(b) Away From The Service Cabinet

Ring or tunnel type C.T's may be mounted in any position not lower than 18 inches and not more than 8 feet from floor level providing that ready and safe access to the secondary terminals will be maintained when the installation is energised. In addition, the general requirements regarding the selection of positions for the installation of Council's metering equipment must be adhered to. (See also Section 11, "Mounting of C.Ts).

Joints in conductors must not be made within the transformer ring or tunnel and all exposed live metal within 12" of the transformer must be insulated or screened in a secure manner by the customer.

Where busbars are used, the section passing through each transformer shall be readily removable. The removable sections must not be more than 18" or less than 12" long.

Where braided rubber or thermoplastic insulated or metal sheathed cables are passed through the transformers, suitable facilities shall be provided by the customer to permit the removal and changing of the transformers. This may consist of a suitable joint in each conductor, or the connection of the conductors to adjacent terminals of service fuses, switchgear, links or the like.

Where a lug is fitted to a conductor it must be of such a size to pass through the transformer ring or tunnel.

Where the sheaths of metal sheathed cables pass through the C.T's, such sheaths must not be earthed or bonded together on the line side of the transformers accept where the transformers are installed at the far end of the cables, in which case the sheaths must not be earthed or bonded on the load side.

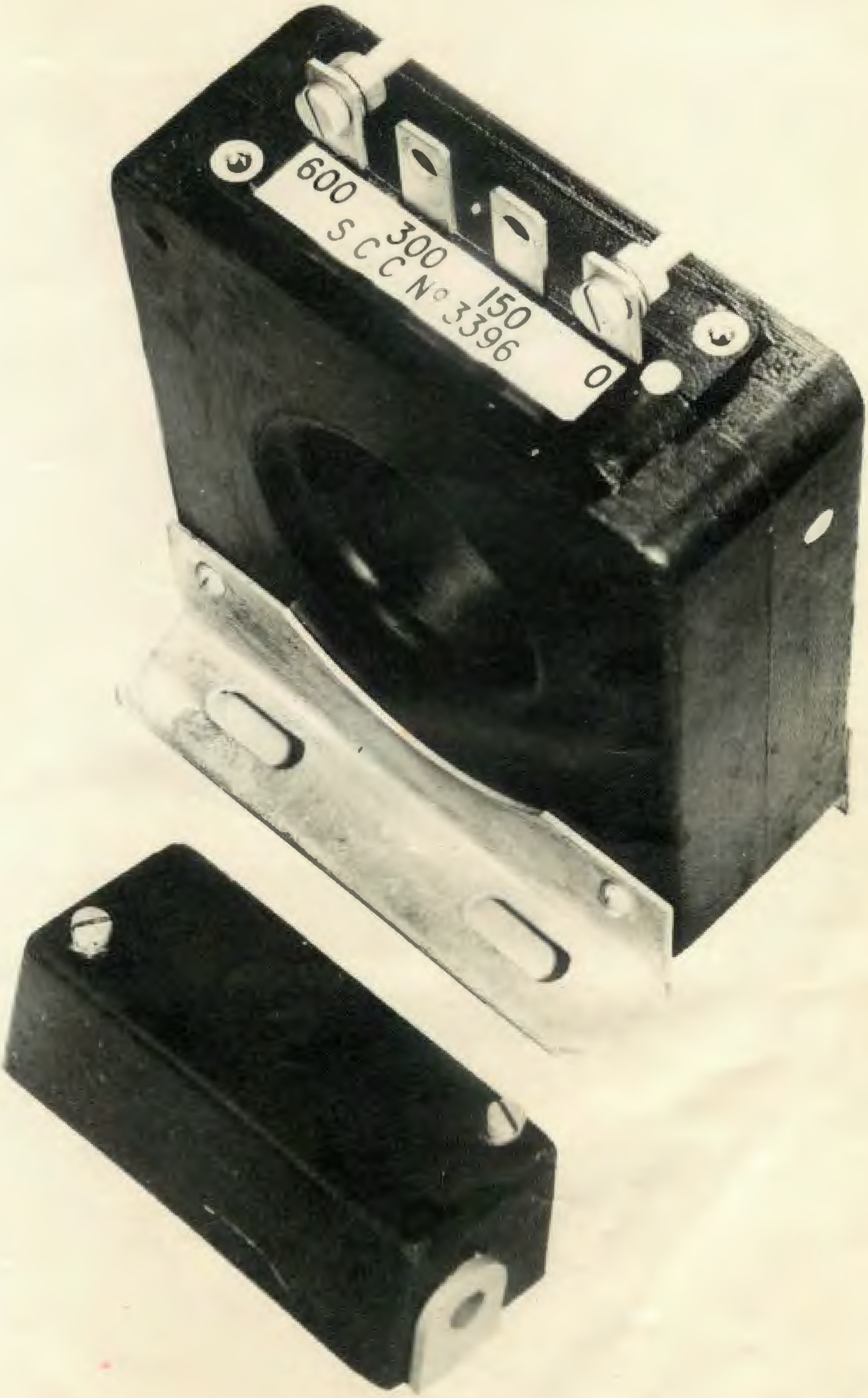


FIGURE 1.

RING OR TUNNEL TYPE ENCAPSULATED MULTI-RANGE CURRENT TRANSFORMER

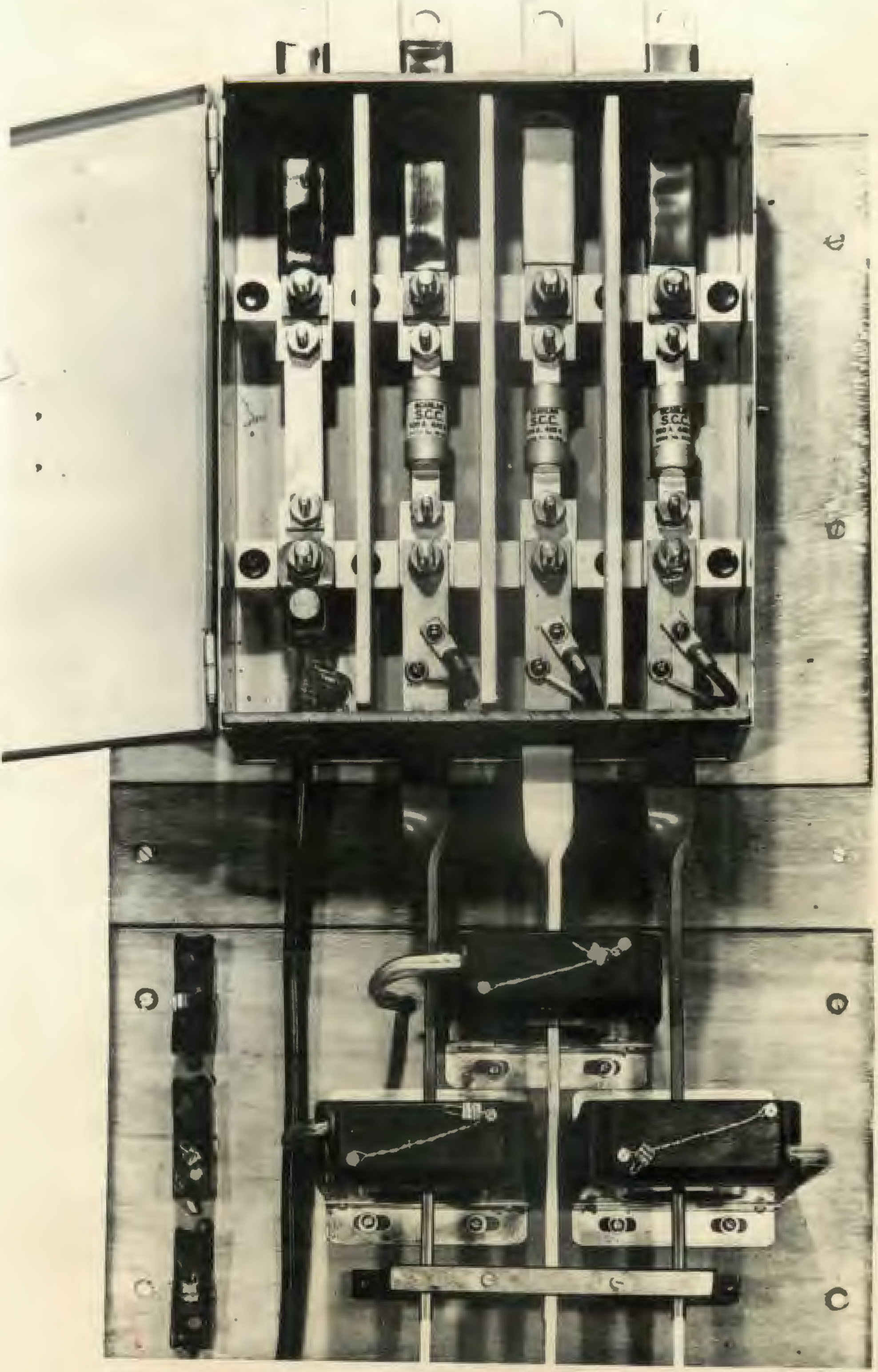
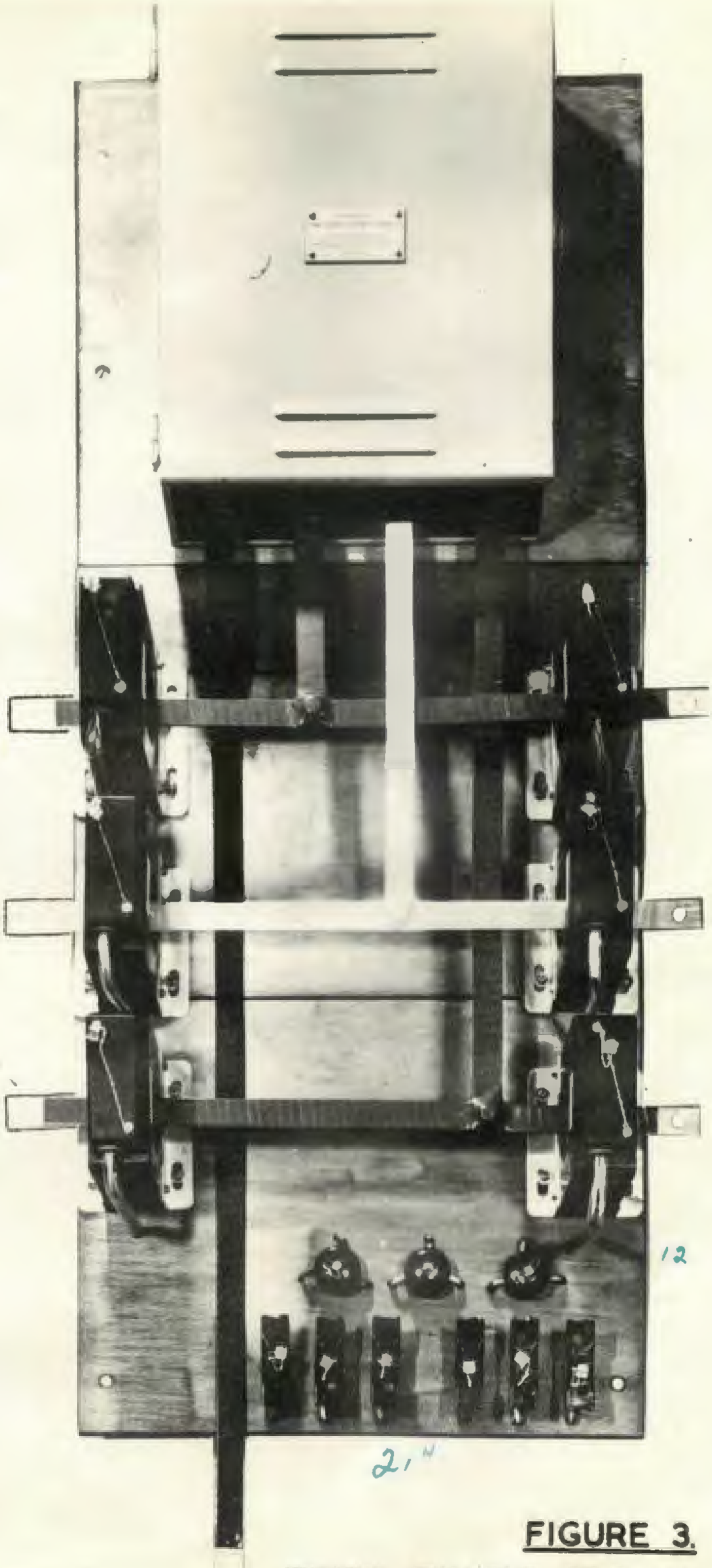


FIGURE 2.

STANDARD CURRENT TRANSFORMER INSTALLATION SHOWING CONNECTIONS OF POTENTIAL CONDUCTORS AND CUSTOMERS 7/·064 CONDUCTORS TO BARS AND THE METERING NEUTRAL CONDUCTOR TO THE MAIN NEUTRAL CABLE LUG



12

2,4"

FIGURE 3.

TYPICAL EXAMPLE OF 2 SETS OF CURRENT TRANSFORMERS CONNECTED TO A 100/400 DISTRIBUTION SERVICE CABINET. THE BOARD SIZES ARE 4"X 21", 12"X 21", 4"X 21", 12"X 21".

WOUND PRIMARY TYPE SINGLE RANGE CURRENT TRANSFORMER (figure 4)

Description

The primary windings of this transformer consists of bars of various cross sectional areas with either 6, 3, 2 or 1 turns according to size. The coils and laminations are mounted in a cast iron frame, the base of which incorporates the mounting holes. The secondary terminals are located at one end under a flat insulating cover, fixed with two screws drilled for sealing. A cable entry is provided at one end of the cover.

This transformer is available in eight sizes: 800/5 amperes; 600/5 amperes; 500/5 amperes; 400/5 amperes; 300/5 amperes; 200/5 amperes; 150/5 amperes; 100/5 amperes.

The 100/5 amp. C.T. is not generally used.

The rating plate is fixed at one end of the transformer, and the polarity marks consist of a white or yellow mark on one of the primary connections and adjacent to one of the secondary terminals.

Installation

These transformers shall be mounted with two 1½" x ⅜" bolts, nuts and washers on any suitable structure provided by the customer.

All primary connections must be made and insulated by Council officers as care must be taken so that undue strain is not placed on the primary windings. 1" x ⅜" bolts, nuts, washers lugs and insulation are provided by the Council for this purpose. The outgoing conductors must be adequately supported by the customer to prevent strain being placed on the winding.

This type of transformer must never be mounted higher than 8 ft. or less than 18" from the floor, and where the secondary terminals are on the bottom side, the transformer must not be mounted within 3 ft. of the floor. Particular care must be taken to ensure that the secondary terminals are in such a position that ready and safe access may be gained when the installation is energised.

If installed in busbars, the distance between bars of opposite polarity must be at least 8 inches.

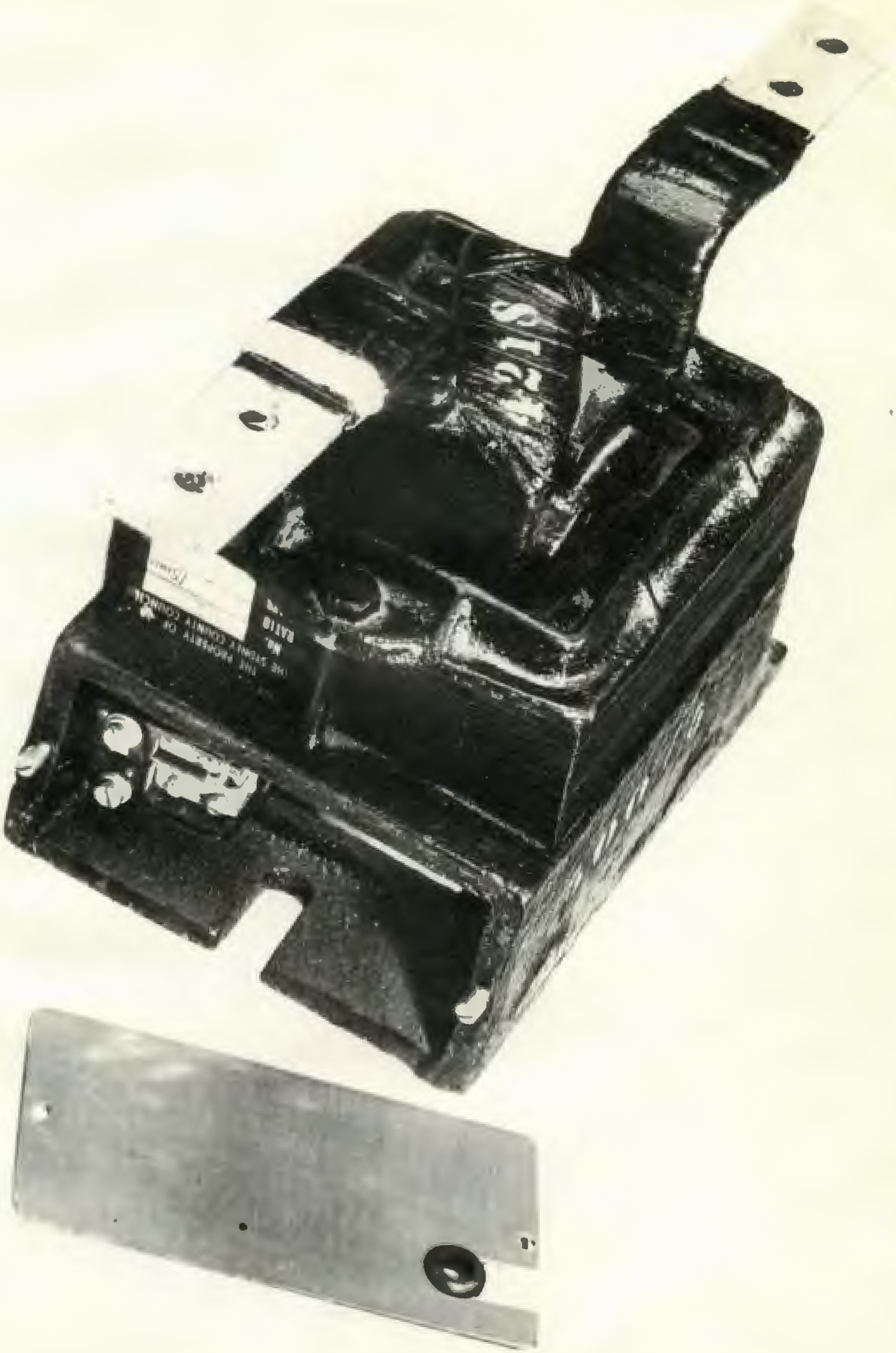


FIGURE 4.

WOUND PRIMARY TYPE SINGLE RANGE CURRENT TRANSFORMER.

TUNNEL TYPE CURRENT TRANSFORMERS, OTHER THAN THE ENCAPSULATED TYPE

Description

(a) Single Range (figure 5)

The two secondary coils of this transformer are so situated that a rectangular hole is made in the centre in which is inserted an insulating sleeve for the passage of the primary cables or bus bars. The insulated secondary coils and the laminations are exposed to view, and the angle iron mounting feet are bolted to the laminations.

The two secondary terminals are enclosed in an insulating cover on top of the transformer which is secured with a ¼" diameter stud, drilled for sealing. A cable entry is provided in each end of the cover.

This transformer is available in six sizes: 1000/5 amperes; 1200/5 amperes; 1500/5 amperes; 2000/5 amperes; 2500/5 amperes; 3000/5 amperes.

The rating plate is fixed to the laminations on the top of the transformer and the current ratio is also stencilled on the coils. The polarity markings consist of painted yellow marks adjacent to one of the secondary terminals for the secondary circuit and on the secondary coils for the primary circuit polarity.

(b) Multi Range (figure 6)

There is a current transformer of similar type to that described above except that it has multi range tappings in the secondary windings with flexible leads taken from each tapping. There are three pairs of leads, one pair for each range, and the range in amperes is marked with beads on the lugged ends.

A short piece of P.V.C. flexible conduit protects the leads which terminate in a metal clad box. Three links are mounted in the box, each having sufficient terminals situated in pairs, for the connection of the three pairs of secondary leads.

Unlike the encapsulated ring or tunnel type multi range C.T., a common tapping is not provided, metering for any particular range must be connected to the appropriate pair of terminals in the link box.

This transformer is available in two sizes, each with three tappings; 2000-2500-3000/5 amperes; 800-1200-1600/5 amperes.

The polarity markings consist of painted yellow marks adjacent to one of the secondary terminals for the secondary circuit polarity and on the secondary coils for the primary circuit polarity.

Installation

As both of the types of transformers depicted in figures 5 and 6 will be used only for replacement of existing transformers of the same type, they will be installed in a similar manner to those being replaced therefore, details of installation methods are not included herein.

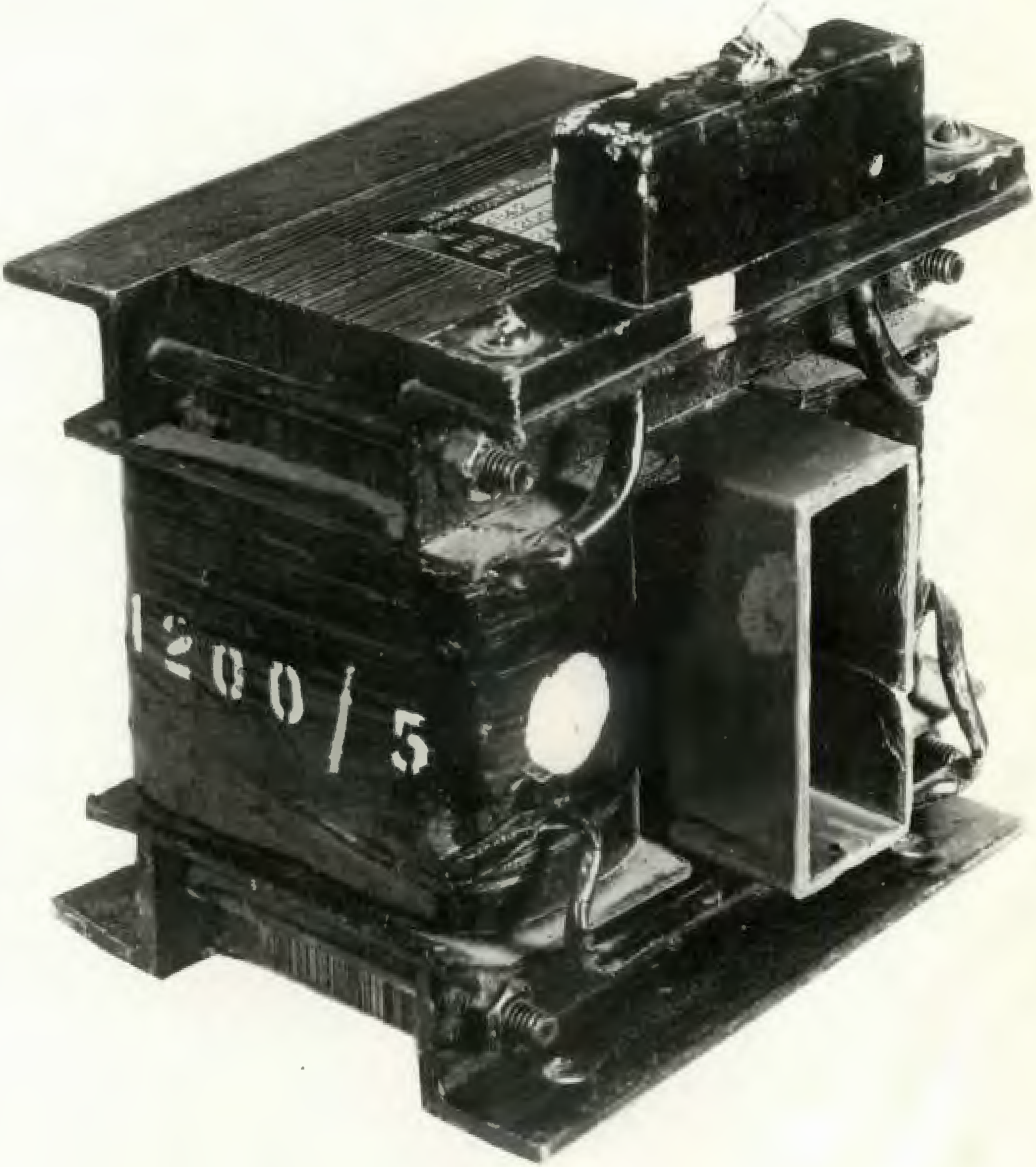


FIGURE 5.

TUNNEL TYPE SINGLE RANGE CURRENT TRANSFORMER

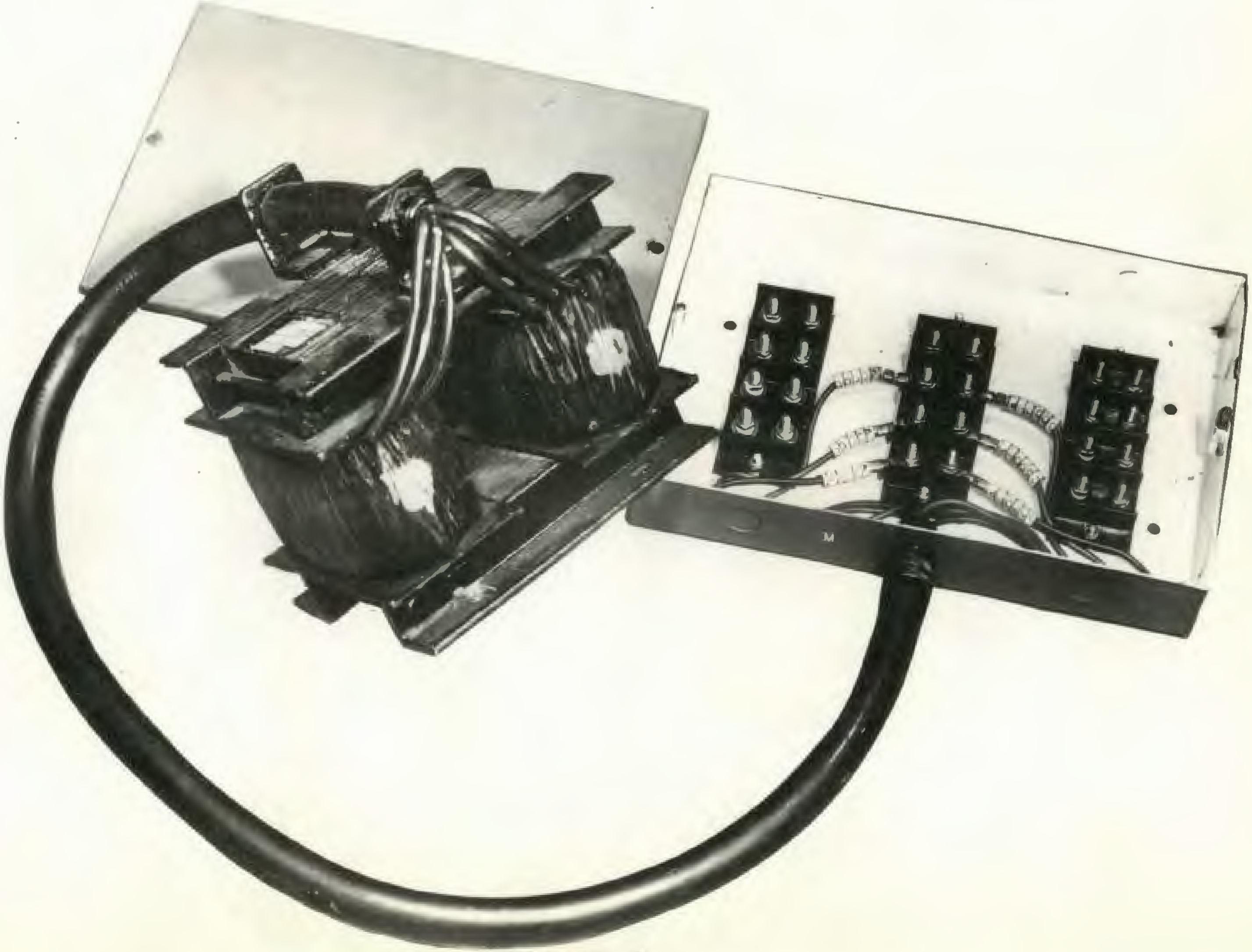


FIGURE 6.

TUNNEL TYPE MULTI-RANGE CURRENT TRANSFORMER AND TESTING BLOCK

RING TYPE MULTI RANGE CURRENT TRANSFORMER (figure 7)

Description

The secondary winding of this transformer is wound on the laminations in a ring form with an outside diameter of approximately 5½". The winding is taped and varnished.

A circular tunnel of approximately 2¼" diameter is provided in the centre for the passage of the primary cables or busbars. This transformer is available in three sizes: 150-300-600/5 amperes; 150-300/5 amperes; 300-600/5 amperes.

The tappings protrude from the winding, the common is marked "O" and each of the others is marked with the primary current corresponding to that particular tapping.

Yellow paint marks identify the polarity connections of the transformer. The primary polarity mark is situated on one face of the ring and the secondary polarity mark is adjacent to the secondary winding common terminal.

A rating plate showing the current ratios and the S.C.C. number is bound to the ring with the tape wrappings.

Installation

This type of transformer was the forerunner of the present encapsulated multi range ring and tunnel types, and as such, the installation methods were not standardised. It is most unlikely that many more will be installed.

As mounting feet are not provided, some transformers may be found clamped in position between bakelite strips or within a plywood case.

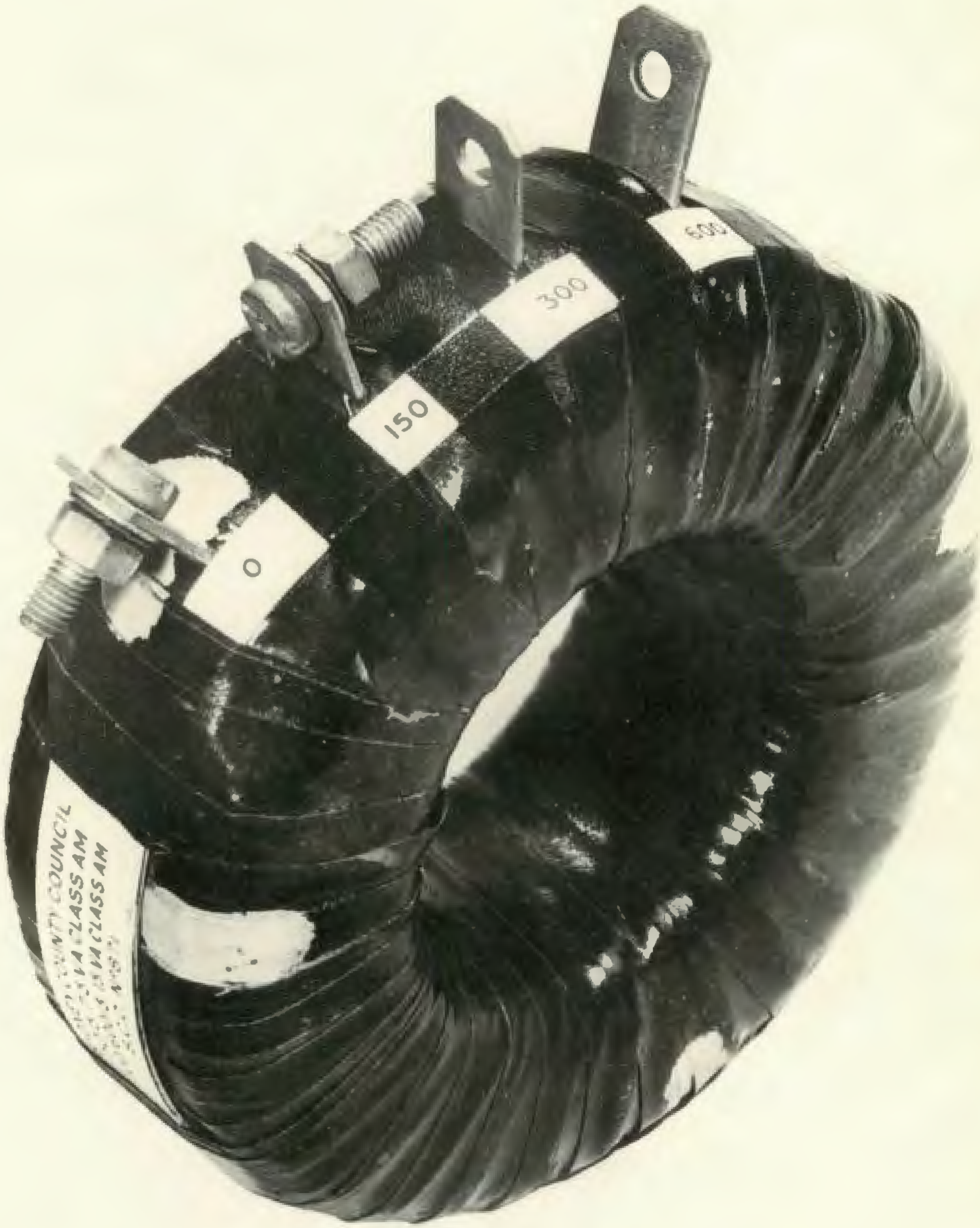


FIGURE 7.

RING TYPE NON MOULDED MULTI-RANGE CURRENT TRANSFORMER

SECTION 7

CONTROL EQUIPMENT

Description, connection, setting and installation of:-

Sangamo Type SSA0 and SSA4 Time Switches Page 1
Venner Type VS4 Time Switch Page 5
Venner Type VS Time Switch Page 8
Newbridge Type SN Time Switch Page 11
Newbridge Type SN k Mk.11 Time Switch Page 15
Sangamo Type KA Time Switch Page 18
Siemens Schuckert Type SSS Time Switches Page 20
Warburton Franki Type WF 11 Time Switch Page 24
" " " WF 12 " " Page 27a
" " " WF 12P " " (Plug-in) Page 27c
Landis & Gyr Type KYB Time Switch Page 28
" " " " 2RD " " Page 31
" " " " (LG) " " Page 33
ATM Rythmatic Consumer Load Control Equipment Page 35
Zellweger Consumer Load Control Relays Types ZEQ 22/1, ZE 22/2, ZE 22/3 and RE1 (Decabit) Page 38
Auxiliary Control Relays and Contactors Page 48

SANGAMO TYPES SSAO AND SSA4 TIME SWITCHES (FIGURES 1 and 2)

Type

The Sangamo type SSAO and SSA4 synchronous motor operated time switch is of the plug-in type having a self-starting synchronous motor enclosed in a cylindrical case of synthetic moulded material. It is of the single pole type, rated at 15 amperes, 240 volts, and is used principally in connection with off peak water heating, thermal storage space heating and similar installations.

All time switches purchased before September 1960 were of the three terminal type whilst those acquired after that date are type SSA4 and incorporate four terminals, but these latter are convertible for three terminal operation.

Many of the three terminal time switches will be modified so that their mechanisms can operate either as 3 or 4 terminal models, depending on the type of bases (three or four terminal) into which they are fitted. Such modified mechanisms will be also designated as SSA4.

NOTE: Under no circumstances must any attempt be made to wire an existing three terminal time switch base as a four wire time switch. This would cause the mechanism of the switch to become alive and create a dangerous condition.

Time Dial (Figure 1 - "B")

The time dial is divided into day and night periods setting out each hour of the day with subdivisions of fifteen (15) minutes, and rotates in an anti-clockwise direction. The time dial is equipped with four tappets which provide for, two "switching on" and two "switching off" operations daily. (Figure 1 - "A").

When adjusting the time, the time dial must be rotated in an ANTICLOCKWISE direction only, otherwise damage may result.

Time Indicator (Figure 1 - "C")

A pointer to indicate the time, marked "Time", is located at the left of the time dial.

Inspection Apertures

Two inspection apertures are provided, one to observe that the motor is running, and the other for the observation of the switch contact points.

The inspection aperture for the motor is located on the housing for the motor ans gears, on the right hand side of the time dial. A white dot is painted on the fibre wheel in the time switch mechanism which rotates when the motor is running.

The aperture for observing the switch contacts is located immediately below the time pointer. (Figure 1 - "D")

Connections.

(a) Three Terminal Type

In the three terminal type of time switch the terminal block is located within the base and the connections are as shown in figure 2 left.

An earthing terminal (bare) is provided on the right hand side of the case but this terminal must not be used.

(b) Four Terminal Type

In the four terminal type of time switch the terminal block is similar to that in the three terminal case but an insulated terminal replaces the earthing terminal, and it is to this terminal that a separate active supply to the motor is connected. (Figure 2 right)

NOTE: Where the four terminal time switch is installed close to the service fuse, the supply to the synchronous motor active terminal shall be taken from the load side of the service fuse. If more than two conductors are connected in parallel at the service fuse, a link shall be used as shown in Circuit Diagram 3A, Section 25.

Where the service fuse is situated some distance from the metering position, e.g. on a pole, the supply for the motor shall be taken from the line side of the master main switch where such exists, or if the mains are to be connected to the meter direct, a link shall be installed in the line side conductor for the connection of this motor supply.

Where for some reason a connection cannot be made at the line side of the master switch, the officer must report the circumstances to his Supervisor.

In a polyphase installation care must be taken to ensure that supply is taken from the same phase as the time switch line terminal.

The Council will provide the necessary 3/.029 cable for the connection of the motor.

Diagram of Connections

Diagrams of connections are moulded into the base of the "three terminal" cases, but a "stick on" diagram of connections is provided in the base of the "four terminal" model.

Insulating Disc.

The design of Sangamo Type time switches is such that the neutral terminal screw in the base is directly in line with an active stud on the time switch mechanism, and it is possible for the neutral screw and the active stud to be in contact should the terminal screw be left near the fully screwed out position. In order to eliminate this hazard, a piece of insulating material has been placed over the active stud on the time switch mechanism, the insulating material being held in position by the male neutral plug. Officers testing or installing time switches shall ensure that the piece of insulating material has been fitted to the time switch.

Setting of Tappets

Two "ON" and two "OFF" tappets are provided to give two switching on and two switching off operations per day if required.

To set the tappets fpr one switching on and one switching off period per day, the following procedure shall be adhered to:-

1. Loosen tappets by holding the time dial, and at the same time turning the bakelite knob (LEFT HAND THREAD) in a clockwise direction, as indicated by the arrow on the knob.

2. Place one of the two tappets marked "OFF" at the required switching off time and the other two hours later, then place one of the two tappets marked "ON" at the required switching on time and the other two hours later.

3. Lock the tappets in position by holding the time dial and at the same time turning the bakelite knob in an anticlockwise direction until the tappets are secure.

Installation

(a) Remove cover by first turning in an anticlockwise direction and lifting away from case.

(b) Remove mechanism from case by holding the bakelite knob and pulling mechanism straight out. Do not remove by pulling on time dial.

(c) Secure base to the meter board with three screws. The screws should be tightened only to a reasonable degree to avoid fracture of the base.

(d) Connect external wiring in accordance with the wiring diagram on the base or with figure 2.

NOTE: The time switch, like the Council's other metering equipment, is not to be earthed.

(e) Insert mechanism.

(f) Set time switch to correct time by turning the time dial anticlockwise until the correct time is indicated by the time pointer.

DAY WHEELS

Day wheels can be fitted to both of these types of time switches when, due to a particular rate or for a customer's requirements, supply is not required on any particular day.

Omitting devices are incorporated in the wheel to prevent the contacts closing on the selected days. Red plugs with a slot and arrow head are provided for this purpose.

A spot of white paint is placed on the word "SUN" (denoting Sunday) which is marked on the Sunday omitting device. This is to facilitate setting the wheel to the correct day in the week, where the time switch is located in dark situations.

To set the omitting device for any particular day, it is only necessary to rotate the slotted pointer head from the inside position until it points to the letters representing the respective day.

The day wheel can be set to the correct day after turning the time dial to the correct time, by rotating the wheel in either direction, until the required day is opposite the fixed pointer (arrow) stamped on the plate and marked "day". It should be noted however, that the day wheel changeover in normal operation is effected by the "ON" tappet and the actual time of day change over depends on the "ON" tappet setting, e.g. if the time switch was set to switch on at 9.00 p.m. on Wednesday, and it was being adjusted in the afternoon of that day, the day wheel would be set for Tuesday as the "ON" tappet would change the day wheel to Wednesday at 9.00 p.m.

Manual Operation

A red push button is provided at the top left hand side of the case. By depressing this button the time switch contacts may be closed or opened without removing the cover. If the cover has been removed, the contact levers may be operated with a pencil. The red push button must be resealed if it has been used.

Sealing

The external push button and the cover shall be sealed in accordance with Section 13 "Sealing and Labelling".

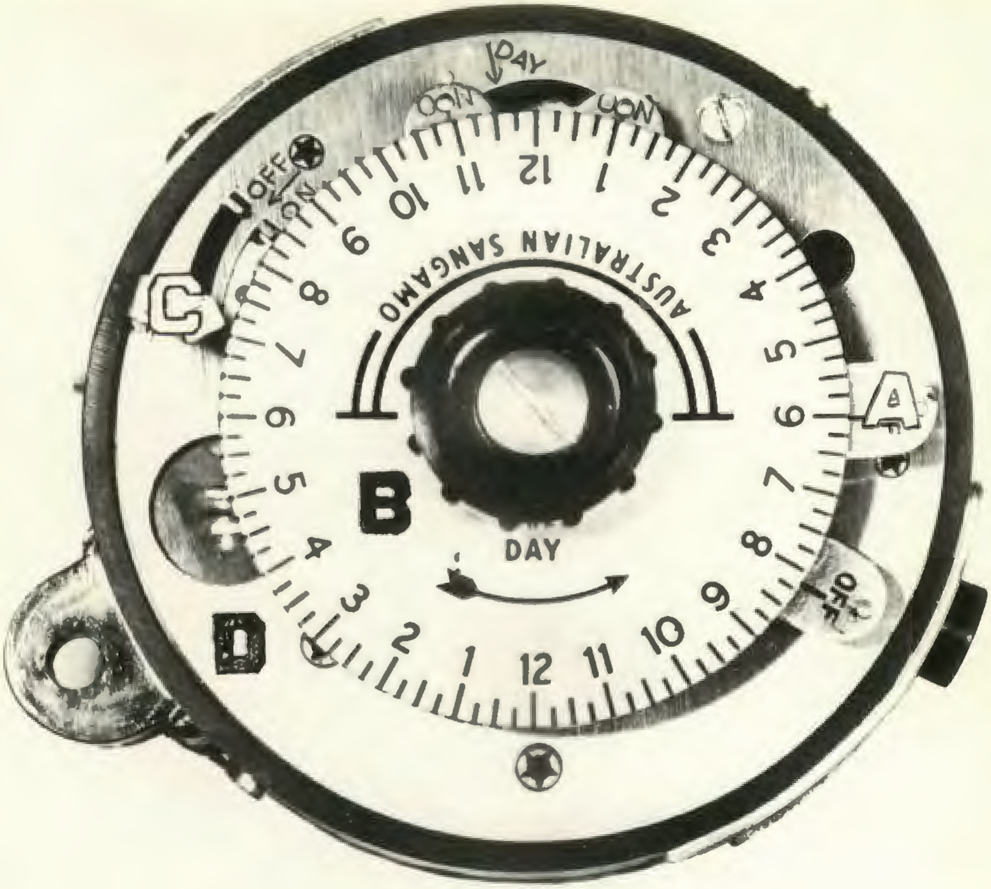


FIGURE 1

SSA4 TYPE TIME SWITCH SHOWING:- "A"- TAPPET, "B"- TIME DIAL, "C"- TIME INDICATOR, "D"- CONTACTS.

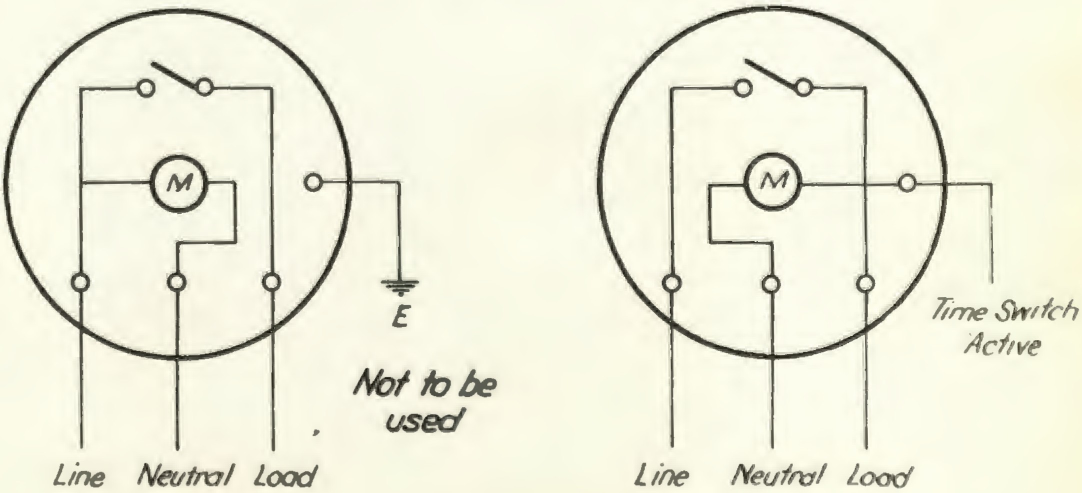


FIGURE 2

LEFT : SSAO TYPE TIME SWITCH CONNECTIONS
RIGHT : SSA4 TYPE TIME SWITCH CONNECTIONS

VENNER, TYPE V.S.4 TIME SWITCH

(Figures 3 and 5)

TYPE

The Venner type V.S.4 is a four wire, synchronous motor-operated time switch of the plug in type enclosed in an aluminium case. It is of the single pole type rated at 20 amperes, 240 volts.

TIME DIAL. (Figure 3 - "B")

The time dial rotates in an anticlockwise direction and is divided into "Day" and "Night" periods. The "Night" period being indicated by a broad black line, extending from 6.00 p.m. to 6.00 a.m. The "Day" period is left unmarked. Each hour of the day is marked with 15 minute sub-divisions on the dial. When adjusting the time, the time dial must be rotated in an ANTICLOCKWISE direction only, otherwise damage may result.

The dial is equipped with four tappets which provide for, two switching on and two switching off operations daily. (Figure 3 - "A").

TIME INDICATOR. (Figure 3 - "C")

A red pointer to indicate the time, marked "TIME", is located at the bottom right centre of the dial.

INSPECTION APERTURES

Two inspection apertures are provided, one to observe that the motor is running, and the other for observation of the switch contact points.

The inspection aperture to observe that the motor is running is located on the housing for the motor and gears, behind the right hand edge of the dial.

The aperture for observing the switch contact points is located on the bottom left hand corner of the time switch. It is necessary to open the door of the case for this inspection.

Connections

A terminal block is mounted inside the case and the connections are as shown in figure 5.

A diagram of connections is located inside the case.

An earthing terminal is provided at the bottom of the case, but this must not be used as Council's metering equipment is not earthed.

NOTE:

Where this time switch is installed close to the service fuse, the supply to the synchronous motor active terminal shall be taken from the load side of the service fuse. If more than two conductors are connected in parallel at the service fuse, a link shall be used as shown in Circuit Diagram 3A, Section 25.

Where the service fuse is situated some distance from the metering position, e.g. on a pole, the supply for the motor shall be taken from the line side of the master main switch where such exists, or if the mains are to be connected to the meter direct, a link shall be installed in the line side conductor for the connection of this motor supply.

Where for some reason a connection cannot be made at the line side of the master switch, the officer must report the circumstances to his Supervisor.

In a polyphase installation care must be taken to ensure that supply is taken from the same phase as the time switch line terminal.

The Council will provide the necessary 3/.029 cable for the connection of the motor.

Setting of Tappets

Two "ON" and two "OFF" tappets are provided to give two switching on and two switching off operations per day if required.

To set the tappets for one switching on and one switching off period per day, the following procedures shall be adhered to:-

1. Loosen tappets by holding time dial and at the same time turning knurled nut in an anticlockwise direction.

2. Place one of the two tappets marked "OFF" at the required switching off time and the other two hours later, than place one of the two tappets marked "ON" at the required switching on time and the other two hours later.

3. Lock the tappets in position by holding the time dial and at the same time turning the knurled nut in a clockwise direction until the tappets are secure.

   As the clearance between the tappets and the time pointer is very small, care must be taken to ensure that the dial is correctly seated on the clock spindle shaft before tightening down.

4. Operate the dial one complete revolution to check that the tappets do not foul the time pointer.

Installation

1. Remove mechanism from case by holding the knurled nut on the dial and the "ON" - "OFF" wheel at the bottom of the mechanism, and pulling mechanism straight out. Do not pull on the dial.

2. Secure time switch to meter board with screws.

3. Connect external wiring in accordance with the wiring diagram in the case, or with figure 5.

4. Insert mechanism.

5. Set time switch to the correct time by turning the time dial anticlockwise, until the correct time is indicated by the time pointer.

Manual Operation

A black knurled wheel, marked with arrow heads and the words "ON" and "OFF" is located at the bottom of the time switch mechanism. The wheel is turned to the left for "ON", and to the right for "OFF".

Sealing

The cover is sealed in accordance with Section 13 "Sealing and Labelling".

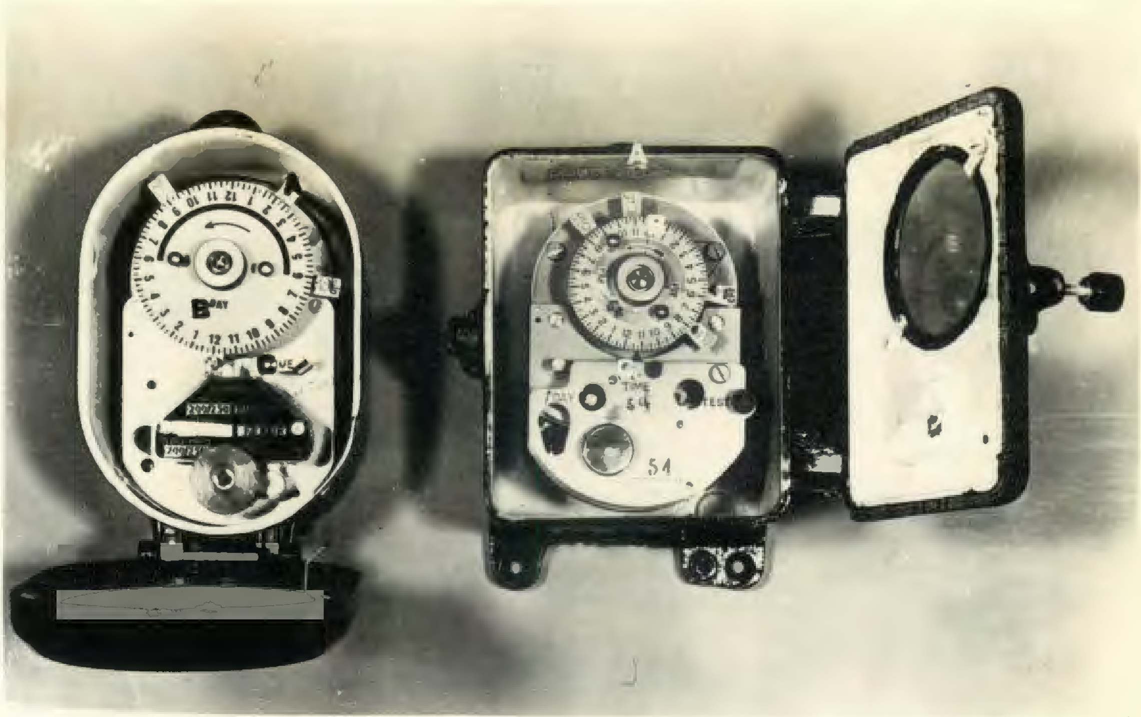


FIGURE 3

VENNER TYPE VS 4 TIME SWITCH

FIGURE 4

VENNER TYPE VS TIME SWITCH

SHOWING:- "A" - TAPPET, "B" - TIME DIAL, "C" - TIME INDICATOR

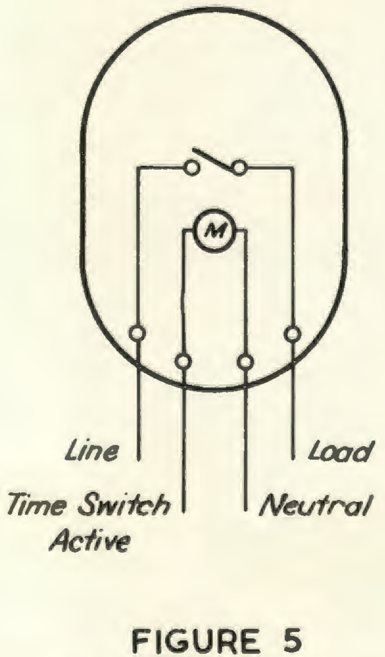


FIGURE 5

VENNER TYPE VS4 TIME SWITCH CONNECTIONS

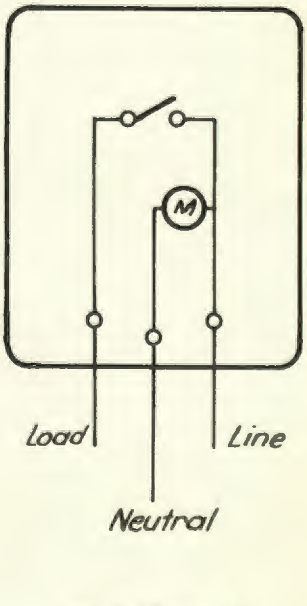


FIGURE 6

VENNER TYPE VS TIME SWITCH CONNECTIONS

VENNER TYPE V.S. TIME SWITCH

(Figures 4 and 6)

Type

The Venner type V.S. synchronous motor operated time switch is of the plug-in type with a self starting synchronous motor enclosed in an aluminium case. It is of the single pole type, rated at 15 amperes, 240 volts.

This time switch may be housed in either a square or an oval case.

Time Dial (Figure 4 - "B")

The time dial rotates in an anti-clockwise direction and is divided into "A.M." and "P.M." periods, and also into "Day" and "Night" periods. The "Night" period, indicated by a shaded area, is from 6.00 p.m. to 6.00 a.m. Each hour of the day with sub-divisions of 15 minutes is also indicated on the dial.

Two "ON" and two "OFF" tappets are provided to give two "switching on" and two "switching off" operations per day. (Figure 4 - "A").

When adjusting the time, the time dial must be rotated in an ANTICLOCKWISE direction only, otherwise damage may result.

Time Indicator (Figure 4 - "C")

A red pointer to indicate the time, marked "Time", is located just below the centre of the dial.

Inspection Apertures.

Two inspection apertures are provided, one to observe that the motor is running, and the other for observation of the switch contact points. The inspection aperture to observe that the motor is running is located on the housing for the motor and gears, on the right-hand side of the dial.

The aperture for observing the switch contact points is located on the bottom left-hand corner of the time switch. It is necessary to open the door of the case for this inspection.

Connections.

A terminal block is located inside the case, and the connections are as shown in figure 6. Note particularly that in this type of time switch, the "line" terminal is on the right-hand side.

A diagram of the connections is moulded in the terminal block and a white mark indicates the load terminal. An earthing terminal is provided but this must not be used as Council's metering equipment is not earthed.

A fuse is installed in the synchronous motor circuit and is located on the under side of the switch base, adjacent to the line terminal plug. To replace fuse, slacken off screw, swing clip clear and eject fuse. After replacement, see that the screw is secure.

Setting of Tappets

Two "ON" and two "OFF" tappets are provided to give two switching on and two switching off operations per day.

To set the tappets for one switching on and one switching off period per day, the following procedures shall be adhered to:-

1. Loosen tappets by holding the time dial and at the same time turning the knurled nut in an anticlockwise direction.
2. Place one of the two tappets marked "OFF" at the required switching off time and the other two hours later, then place one of the two tappets marked "ON" at the required switching on time and the other two hours later.
3. Lock the tappets in position by holding the time dial and at the same time turning the knurled nut in a clockwise direction - finger-tight is sufficient.

As the clearance between the tappets and the time pointer is very small, care must be taken to ensure that the dial is correctly seated on the clock spindle shaft before tightening down. Operate dial one complete revolution to check that the tappets do not foul the time pointer.

Installation

1. Remove mechanism from case by pulling on the handle. Some early types were not fitted with a handle and the mechanism must be removed by holding the knurled dial nut and the knurled knob at the bottom of the mechanism, and pulling straight out. Do not remove by pulling on the time dial.
2. Secure case to meter board by means of screws in the three external fixing feet. (or two screws in base if of the oval type).
3. Connect external wiring, in accordance with the wiring diagram or with figure 6.
4. Insert mechanism.
5. Set time switch to correct time by turning time dial in an anti-clockwise direction until the correct time is indicated by the time pointer.

Manual Operation

A red push button marked "test" which enables manual switching on and off is provided. It is necessary to open the door of the case to operate this push button.

Sealing

If the time switch has a square case, pass a sealing wire through the sealing hole in the knurled knob and in the case. If the case is oval pass sealing wire through sealing hole in round, moveable catch and through the sealing hole in cover. Seal in accordance with Section 13, "Sealing and Labelling".

NEWBRIDGE (Horstmann) TYPE S.N. TIME SWITCH

(Figures 7 and 9)

Type

The Horstmann Gear Co. Ltd. "Newbridge" type SN synchronous motor operated time switch is of the "plug in" type with a self starting synchronous motor mounted inside an aluminium case, the door of which is secured by a two lever locking and clamping device operated by the outside lever. A window is provided in the door of the case for observation of time settings. It is of the single pole type rated at 15 amperes, 240 volts.

There is a small number of these switches fitted with a "delay off" tappet to provide for a later cut out on Sundays. The procedure for the setting of both types is set out below.

Time Dial (Figure 7 - "B")

The time dial rotates in a clockwise direction and is divided into night and day periods with divisions for each hour of the night and day from 6.00 p.m. to 6.00 a.m. and 6.00 a.m. to 6.00 p.m. respectively, and each hour has subdivisions of 15 minutes.

In the earlier time switches supplied, the day period is indicated by a light coloured band and in the later type the periods are indicated by the words "day" and "night".

When adjusting the time, the time dial must be rotated in a CLOCKWISE direction only, otherwise damage may result.

Time Indicator (Figure 7 - "C")

A pointer to indicate the time is located adjacent to the edge of the time dial at the top centre of the dial.

Inspection Apertures

There are no inspection apertures in this time switch.

Operation

The contact points of the switch are operated by a cam which, in turn, is operated by a lever.

This lever is situated behind the dial and protrudes through a slit in the clock movement case, and when operating, travels from one side of the slit to the other.

The position of the lever when on the extreme right hand of the slit indicates "switch closed" and when on the left hand side "switch open".

The time switch is so constructed that there should be no necessity to remove the dial from its spindle, except in time switches fitted with a "delay off" tappet where it becomes necessary to alter the "delay off" to other than a Sunday.

Connections

A terminal block is located inside the case and the connections are as shown in figure 9.

An external earthing terminal is provided but this must not be used as Council's metering equipment is not earthed.

Setting of Tappets. (Figure 7 - "A")

a. Time Switches not Fitted with "Delay Off" Tappet

(i) Four (4) tappets are provided, an "ON", "OFF" and intermediate "OFF".

(ii) Rotate dial in a clockwise direction until correct time of day is opposite the trailing edge of the time pointer.

(iii) Release dial clamp (a small brass lever located in centre of dial boss).

(iv) Move "ON" tappet until arrow-head (located on trailing edge of tappet) indicates operating time.

(v) Move intermediate "ON" tappet over the intermediate "OFF" tappet, which renders these tappets inoperative. (This operation gives an idle movement to these tappets).

(vi) Move "OFF" tappet until arrowhead (located on trailing edge of tappet) indicates operating time.

(vii) Move intermediate "ON" and "OFF" tappets to a position one hour behind the operating time of the "OFF" tappet.

(viii) Having set all four tappets correctly, press down the dial clamp and turn the dial through a complete cycle of operations (i.e. seven (7) days) to ensure that the mechanism operates in the correct sequence.

b. Time Switches Fitted with "Delay Off" Tappet

A small number of "Newbridge" time switches have been supplied with a "delay off" tappet.

The limit of the "delay off" is 8½ hours later than the normal operating "OFF" time.

(i) The dial must always be turned in a clockwise direction.

(ii) Turn the entire dial until the time pointer has just turned the "STAR" wheel and the "STAR" wheel has passed the time pointer. Turn the "STAR" wheel only, by hand, to a day other than that on which the delay off is required.

(iii) Turn the entire dial a little further until the "OFF" tappet behind the dial has commenced to lift the time pointer.

(iv) Lift the dial clamp and turn the engraved dial plate only (not the entire dial) until the normal off time is in line with the left hand edge of the abovementioned "OFF" tappet (the one behind the dial).

(v) Set the "DELAY OFF" tappet until its left hand edge is at the "DELAYED OFF TIME" required.

(vi) Set the "ON" tappet to the required time of operation.

(vii) The intermediate "ON" and "OFF" tappets, when not required to operate, are readily rendered inoperative by slipping the "ON" tappet over the "OFF" tappet when an idle movement is obtained.

(viii) Having set all five tappets correctly, press down the dial clamp and turn the dial through a complete cycle of operations (i.e. seven days) to ensure that the mechanism operates in the correct sequence.

(ix) It should be noted that the correct day of the week is shown about 2½hours before the normal off time.

(x) Finally, before leaving the time switch ready for service, check the setting of the dial for the correct time, the star wheel to the correct day.

(xi) The dial is so adjusted when despatched, that the late or "DELAY OFF" tappet operates only on Sundays. This day may be varied by removing or inserting pins in the appropriate day or days in the "STAR WHEEL". To enable this to be done, the dial must first be removed, and this is accomplished by raising the dial clamp and pulling the dial plate off its spindle, upon which it is frictionally mounted.

Installation

(1) Remove mechanism by means of the brass handle fitted over the terminal. Do not attempt to remove by pulling on the time dial.

(2) Secure time switch base to meter board with two screws in base.

(3) Connect external wiring, in accordance with the wiring diagram or with figure 9.

Note that the neutral and load terminals are adjacent and care must be taken to ensure that the leads do not project beyond the terminals. Barriers have been fitted between adjacent terminals in most time switches.

(4) Insert mechanism by means of the brass handle.

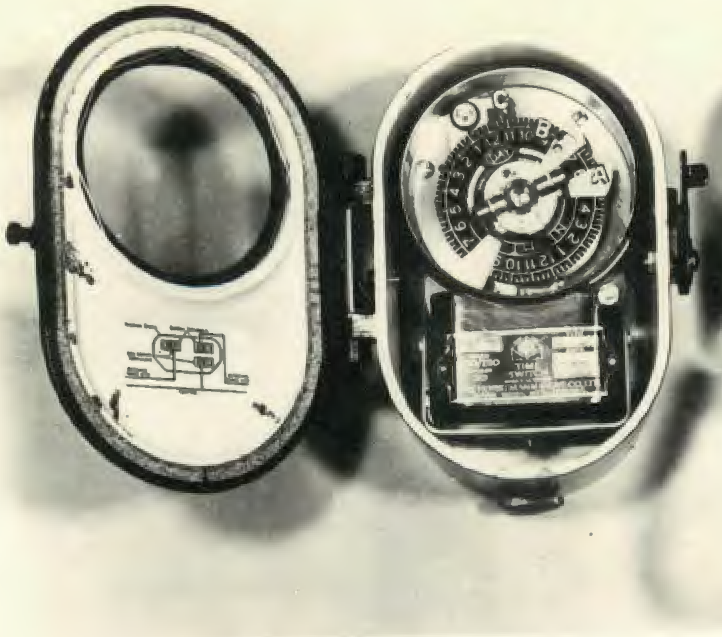
(5) Set time switch to the correct time by turning the dial clockwise until the correct time is indicated by the time pointer.

Manual Operation

To switch on, raise the time indicator and allow it to return to normal position. The switch cannot be switched off this way.

Sealing

Pass the sealing wire through the sealing hole in the door of the case and the holes in the locking levers twice. Seal in accordance with Section 13 "Sealing and Labelling".



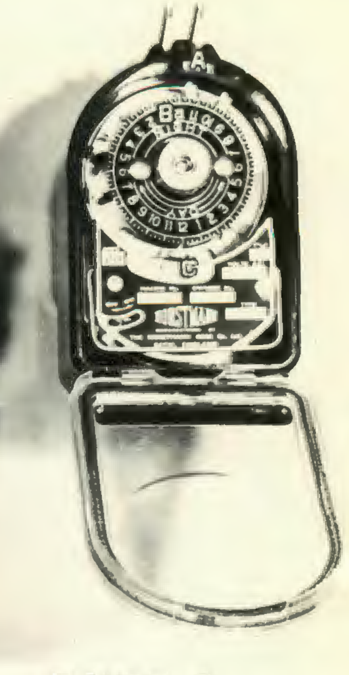


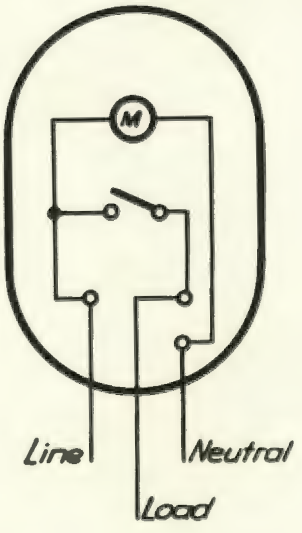
FIGURE 7

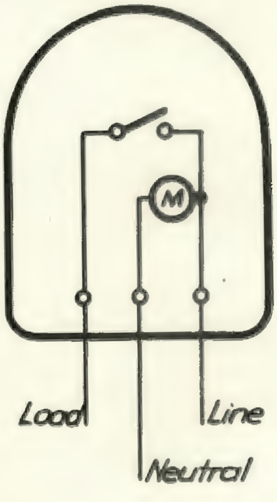
NEWBRIDGE TYPE SN
TIME SWITCH

FIGURE 8

NEWBRIDGE TYPE SN. K. MK. II
TIME SWITCH

SHOWING:-"A" - TAPPET, "B" - TIME DIAL, "C" - TIME INDICATOR.





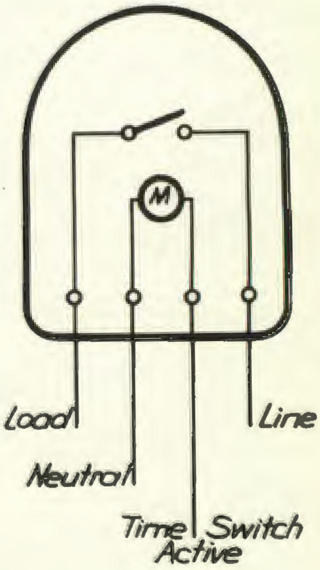


FIGURE 9

NEWBRIDGE TYPE SN TIME
SWITCH CONNECTIONS

FIGURE 10

3 TERMINAL

FIGURE 11

4 TERMINAL

NEWBRIDGE TYPE SN. K. MK. II
TIME SWITCH CONNECTIONS

NEWBRIDGE (or Horstmann) TYPE SN. K. Mk.11 TIME SWITCH

(Figures 8, 10 and 11)

Type

The Horstmann Gear Co. Ltd. "Newbridge" type SN.K. Mk 11. synchronous motor operated time switch is of the "plug in" type with a self starting synchronous motor, mounted inside a case of synthetic moulded material, the cover of which is of clear plastic material, hinged at the bottom and fastened with a wire spring clip at the top.

The switch is of the single pole type, rated at 20 amps. 240 volts.

All time switches purchased prior to 1962 were of the three terminal type whilst those acquired after that date are the four terminal type. There is no difference in the external appearance of both types except that the S.C.C. serial number is shown on a plate attached to the clear hinged cover on the three terminal time switch and on the name plate under the cover on the four terminal type.

Time Dial. (Figure 8 - "B")

The time dial rotates in a clockwise direction and is divided into night and day periods with hourly divisions which are sub-divided into $\frac{1}{4}$ hour periods. Two buttons are mounted on the dial for turning by hand. When adjusting the time, the time dial must be rotated in a CLOCKWISE direction only, otherwise damage may result.

Time Indicator. (Figure 8 - "C")

A pointer to indicate the time is located at the bottom of the time dial.

Inspection Apertures

An inspection aperture is located in the motor housing at the bottom right of the dial to observe that the motor is running.

Connections

A terminal block is mounted in the case and the connections are as shown in figure 10 for the three terminal type and in figure 11 for the four terminal type.

A diagram of connections is located in the cases for each type.

An earthing terminal is provided at the rear of the main terminals, but this must not be used as Council's metering equipment is not earthed.

NOTE:

Where the four terminal time switch is installed close to the service fuse, the supply to the synchronous motor active terminal shall be taken from the load side of the service fuse. If more than two conductors are connected in parallel at the service fuse, a link shall be used as shown in Circuit Diagram 3A, Section 25.

Where the service fuse is situated some distance from the metering position, e.g. on a pole, the supply for the motor shall be taken from the line side of the master main switch where such exists, or if the mains are to be connected to the meter direct, a link shall be installed in the line side conductor for the connection of this motor supply.

Where for some reason a connection cannot be made at the line side of the master switch, the officer must report the circumstances to his Supervisor.

In a polyphase installation care must be taken to ensure that supply is taken from the same phase as the time switch line terminal.

The Council will provide the necessary 3/.029 cable for the connection of the motor.

Setting of Tappets

Two "On" and two "Off" tappets are provided to give two switching on and two switching off operations per day. (fig. 8 - "A")

To set the tappets for one switching on and one switching off period per day, the following procedure shall be adhered to:

(1) Loosen the tappets by holding the dial and at the same time turning the knurled knob in an anticlockwise direction.

(2) Place one of the two "Off" tappets at the required switching off time, and the other two hours later. Then place one of the two "On" tappets at the required switching on time and the other two hours later. See that the marked trailing edge of the tappets coincides with the required hours.

(3) Lock the tappets in position by holding the time dial and at the same time turning the knob in a clockwise direction until the tappets are secure.

Installation

(1) Drop cover down by raising the wire clip at the top of case.

(2) Remove mechanism by grasping the handle and pulling mechanism straight out. Do not attempt to remove by pulling on the time dial.

(3) Secure the case to the meter board with three screws. These should be tightened to a reasonable degree to avoid fracture of the case.

(4) Connect the external wiring in accordance with the wiring diagram in the case or with figures 10 and 11 as appropriate.

(5) Insert mechanism.

(6) Set time switch to the correct time by turning dial clockwise with the button provided until correct time is indicated by the time pointer.

(7) Replace and fasten the cover. In so doing care must be taken with the three terminal type when lifting the cover into position to ensure that the bottom edge of the case fits against the gasket as the cover may foul the case and break.

Manual Operation

An "Off" - "On" lever is situated in a slot at the bottom left side of the name plate.

Sealing

A sealing wire must be passed through the sealing hole in the cover sealing lug at the top of the case and through the end of the wire fastening clip. It is then sealed in accordance with Section 13 "Sealing and Labelling".

SANGAMO TYPE K.A. TIME SWITCH

(Figures 12, 13 and 14)

Type

The Sangamo type K.A. time switch is available in two sizes, single pole, 35 amperes, 240 volts, designated SP/KA 35/240; double pole, 35 amperes, 415 volts, designated DP/KA 34/415.

The time switch is the synchronous motor operated type, and is generally enclosed in a metal case, the door of which has a latch for sealing purposes. The case contains knockout blanks to allow the connection of the conductors to the terminals, and also an inspection window for observing the time.

Time Dial (figure 12 - "B")

The time dial rotates in an anticlockwise direction and is divided into Night and Day periods, with divisions for each hour of the night and day from 6 p.m. to 6 a.m., and 6 a.m. to 6 p.m. respectively. The Night period is indicated by a black marking on the dial.

The hour markings are subdivided into 15 minute periods. A minute dial (figure 12 - "D") is located just below the time pointer, and the pointer for this dial moves through one revolution in each hour and can be used if a close adjustment of the time switch is required.

When adjusting the time, the time dial must be rotated in an ANTICLOCKWISE direction only, otherwise damage may result.

Time Indicator (figure 12 - "C")

A pointer to indicate the time, marked "Time", is located near the bottom of the time dial.

Inspection Aperture

An inspection aperture to observe if the motor is running is located on the housing for the time switch mechanism near the bottom left hand corner.

Connection

A terminal block is located inside the case at the bottom of the time switch housing and a diagram of connections is located inside the cover. The connections are as shown in figures 13 and 14 for the single and double pole types respectively.

Setting of Tappets (figure 12 - "A")

The time switch can be set for one, two or three "ON" and "OFF" operations, each 24 hours. To change the lever setting times, loosen black thumb nut on the "Hour" dial as indicated bu turning to the right, set levers to desired position and tighten thumb nut by turning to left.

For a single "ON" and "OFF" operation in 24 hours, the three levers are stacked together. For two or three operations the levers are separated with alternate "ON" and "OFF" positions. The time at which an operation occurs is indicated by the positions of the radial (leading) edge of the levers.

To set the "Hour" dial, turn the small protruding knurled knob (figure 12 - "E") in a clockwise direction, until the time pointer at the left of the minute hand indicates approximate time, then observe small minute hand for final adjustment.

Note: The "Hour" dial should always be turned in this manner.

Installation

(1) Hang time switch on one screw from mounting bracket fixed to back of case.

(2) Open door and secure base with two screws.

(3) Connect external wiring according to the diagram of connections or with figures 13 and 14. Ensure that cable entry in case is bushed.

(4) Set time switch to correct time by turning small protruding knurled knob. (figure 12 - "E")

(5) Close cover and fasten with catch on right hand side.

Manual Operation

To close switch move lever marked "ON" in the direction indicated by the arrow. To open switch move lever adjacent to the time pointer and marked "OFF" in direction indicated by arrow.

Sealing

The cover of time switch shall be sealed in accordance with Section 13 "Sealing and Labelling".

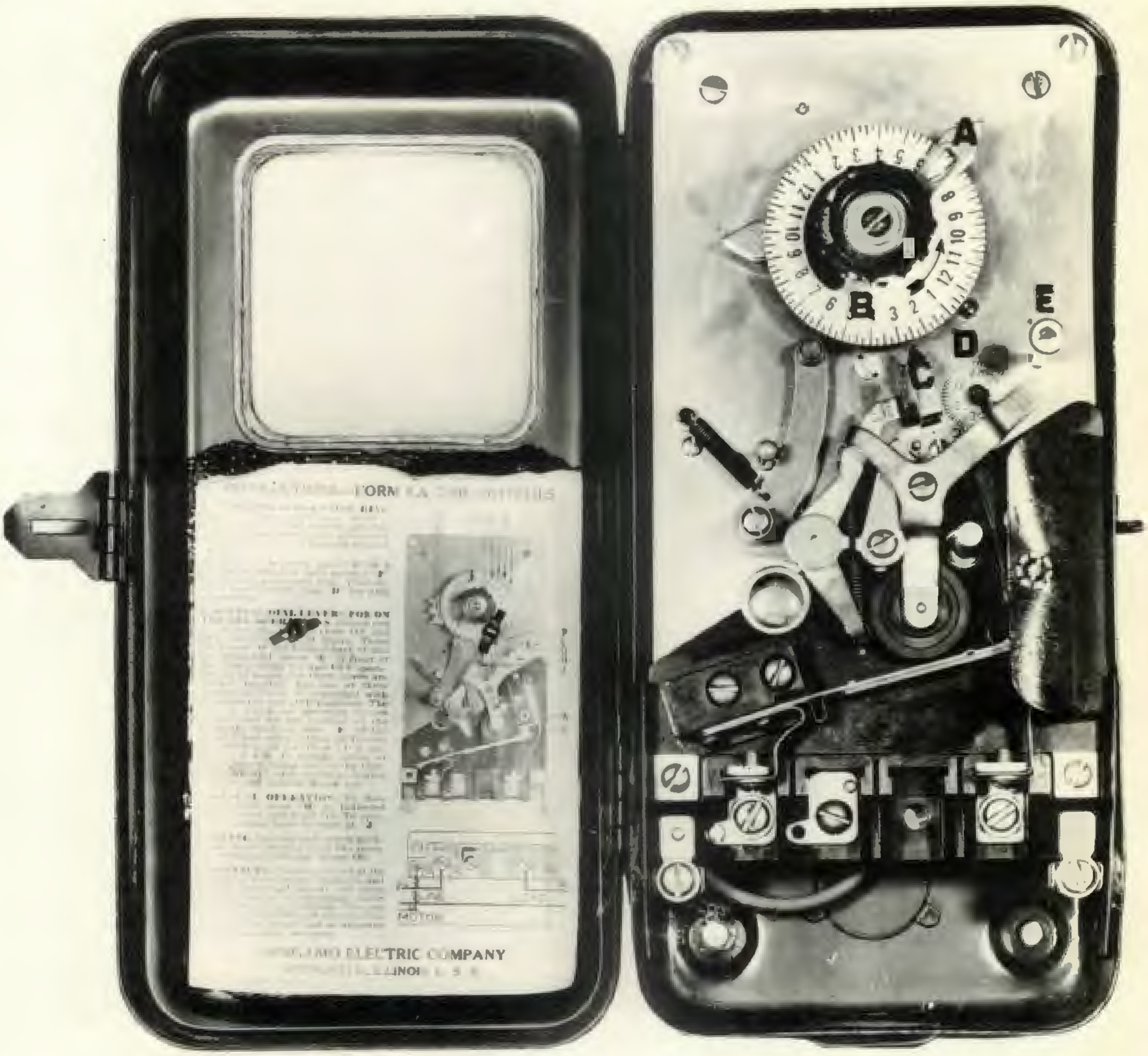


FIGURE 12

SANGAMO TYPE KA SINGLE POLE TIME SWITCH SHOWING:-
"A"- TAPPET, "B"- TIME DIAL, "C"-TIME INDICATOR,
"D"-MINUTE DIAL, "E"-TIME ADJUSTMENT KNOB.

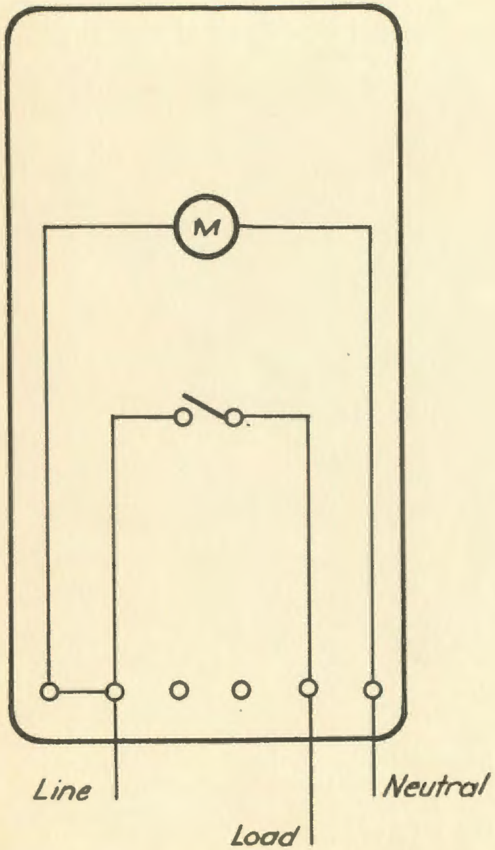


FIGURE 13

SANGAMO TYPE KA SINGLE POLE TIME SWITCH CONNECTIONS

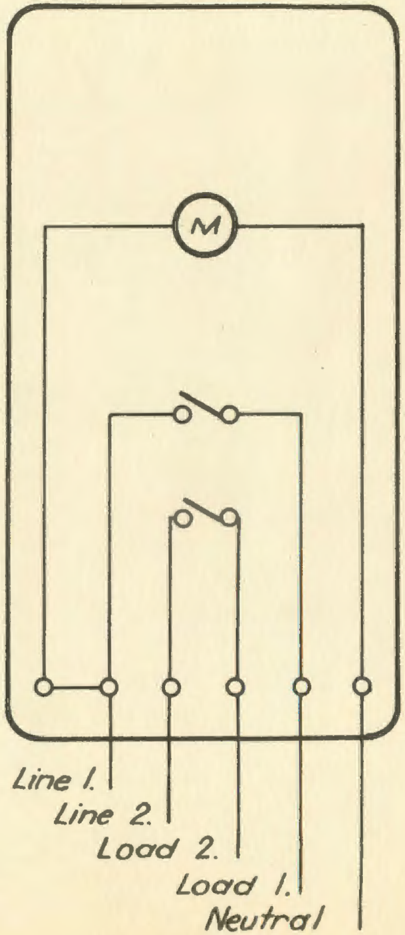


FIGURE 14

SANGAMO TYPE KA DOUBLE POLE TIME SWITCH CONNECTIONS

SIEMENS SCHUCKERT TYPE SSS TIME SWITCHES

(Figures 15 to 20)

Type

The Siemens Schuckert Type SSS time switch has a self-starting synchronous motor enclosed in a pressed sheet metal case.

Incorporated in the cover of the time switch is a hinged circular subsidiary inspection cover, having attachments for sealing, and also a window immediately in front of the time switch dial for observation of time settings.

The time switch is of the single pole type, rated at 15 amperes, 240 volts, and is used generally where the required switching times are irregular.

When this type of switch is used to control latching contactors, additional contacts, which are closed when the time switch is in the open position, are fitted.

A label is attached to the window to indicate whether it is arranged for the control of a contactor or a special rate, or whether certain days are omitted.

Some of these time switches are operated by a clockwork escapement mechanism which is electrically wound (figure 18 - "F"). It is similar in all other respects except a minute dial is mounted under the hour time dial to give finer settings (figure 18 - "G").

Time Dial ("B" in figure 17)

Early Model (figures 15 and 17)

The time dial rotates in a clockwise direction and is marked 1-24 with half-hour sub-divisions. No. 1 on the dial = 1 a.m., No. 2 = 2 a.m., and so on to No. 12 which is Midday. No. 13 = 1 p.m., No. 14 = 2 p.m. and so on to No. 23 which is 11 p.m., and No. 24 which is shown on some dials as T1 is midnight.
T2

Two knurled pins, which are screwed into the time dial, determine the time of operation of the switch (figure 17 - "A"). There are two rings of holes in which the pins may be inserted. The pin, when located in the outer ring of holes, determines the switching IN time, and the pin located in the inner ring of holes determines the switching OUT time.

Late Model (figures 16 and 18)

In the later models of this switch, the two rings of holes have been superseded by a grooved ring near the outer edge of the dial, and riding clips are provided in lieu of the setting pins (figures 16 and 18 - "A"). The riding pins are marked No. 1 and No. 2, the No. 1 pin controls the cutting in time and the No. 2 pin the cutting out time of the switch.

When adjusting the time, the time dial must be rotated in a CLOCKWISE direction otherwise damage may result.

Time Indicator ("C" in figures 16, 17 and 18)

The time pointer rises vertically from the centre spindle of the dial. The pointer remains stationary, and as the dial rotates the pointer indicates the time of the dial.

Connections

(i) Normal Type - Single Contacts

A terminal block is located at the base of the time switch, and four terminals are provided. The extreme left hand terminal is either bridged internally to the terminal next to it or completely disconnected, the connections being as shown in figure 19. Note, the "line" and "load" terminals are adjacent to each other.

(ii) Double Contacts Controlling Latching Contactors: (See "Latching" contactors, Page 23)

The four terminals of the terminal block are used in this case, the connections being as shown in figures 20 and 30.

Special Rates

When type SSS time switches are used for controlling special rates, additional mechanism is provided in the time switch. This mechanism consists of a seven-tooth star wheel which is operated from two levers attached to the dial, so that in each 24 hours the star wheel advances 2/7th of a revolution, or completes a revolution in three and a half days. One of the levers is fixed and operates the star wheel at midnight. The other is located in a crescent-shaped slot near the centre of the dial, and can be adjusted to operate the star wheel at any time between 6.00 a.m. and 6.00 p.m. The normal setting is 12 noon.

The star wheel operates a day wheel located at the bottom right side, behind the time dial which is marked with seven numbered divisions, the seventh position being coloured red. On the plate carrying the day wheel is a red line or pointer, and the numeral of the day wheel, which is opposite this line, indicates the day of the week, taking Monday as No. 1.

The star wheel rotates through two complete revolutions for one revolution of the day wheel. It is important to check that the midnight operation of the star wheel moves the day wheel into the first half or the A.M. position of a numbered division of the day wheel. If the midnight operation of the starwheel operates the day wheel to a P.M. position, manually operate the day wheel to the A.M. position. In order to carry out this operation, the dial must be operates to a position so that the lever is clear of the star wheel.

The day wheel is fitted with a cam which, in turn, operates a lever and controls the opening of the time switch contacts on any particular day or days, dependent upon the design of the cam.

Setting Time Switch for Correct Time.

(i) Type Controlling Off Peak Rate - Not Special Rate - Day Wheel Not in Use.

The time dial shall be rotated in a clockwise direction until correct time is indicated by the time pointer. The dial must not be rotated in an anticlockwise direction, as damage to the clock will result.

(ii) Type Controlling Special Rates - Day Wheel in Use (figure 30)

To set the time switch for correct time and the correct day of the week, the dial shall be rotated in a clockwise direction until the number corresponding to the day of the week on the day wheel is opposite the red line or pointer on the plate carrying the day wheel. The day wheel is numbered 1 to 7, Monday being No. 1. It is important to check that on the midnight movement, the day wheel moves to the first half or a.m. position of a numbered division.

Set for correct time by correlating the time pointer with the time graduations on the dial. Check the time switch for correct switching by manually operating the time dial over a period of seven days.

Adjustments must be made only when the time switch is in a fixed vertical position.

When time switches are adjusted in the Meter Test Room it is necessary at times, due to slight inaccuracies in the manufacture or the fitting of the cam, to set the P.M. lever at a position other than 12 noon. Installation Inspection branch officers must not alter the setting of this lever. If the time switch is found to be incorrect it must be reported accordingly to the officer's supervisor/Meter Superintendent.

(iii) Time Switches Controlling Latching Contactors (See figure 30, this section)

When type SSS time switches are used to control latching contactors, additional contacts are fitted in the switch to control separately the supply to the opening and closing coils of the contactors.

There are two fixed contacts and one moving contact. Inside the time switch the neutral of the supply is connected to the centre or the moving contact, and the supply for the closing and opening coils of the contactor is connected to the fixed contacts.

Manual Operation

There is no provision other than by rotating time dial.

Sealing

Provision is made for separately sealing the terminal cover and the inspection aperture. These must be sealed in accordance with Section 13 "Sealing and Labelling".

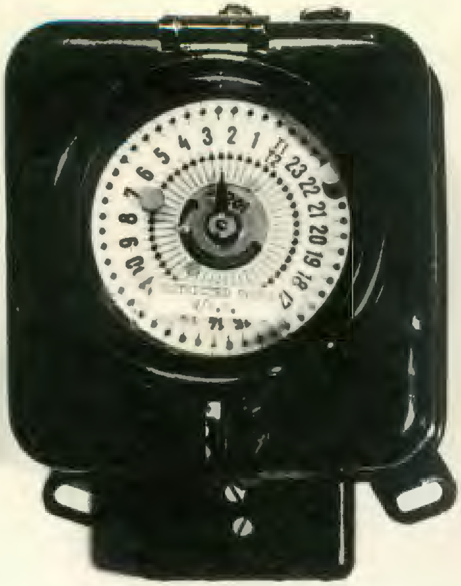


FIGURE 15

SIEMENS SCHUCKERT SSS TYPE SPECIAL RATE TIME SWITCH WITH COVER IN PLACE.

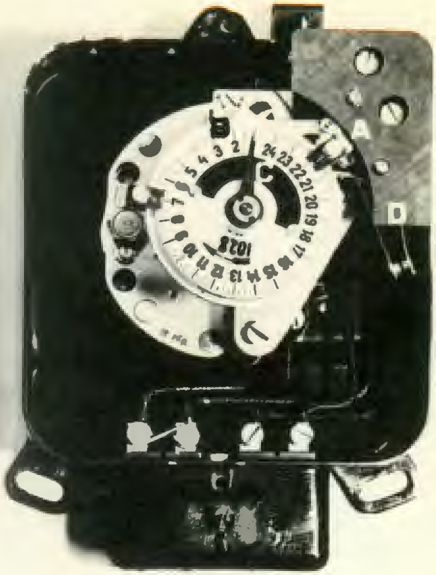


FIGURE 16

SIEMENS SCHUCKERT SSS TYPE STANDARD TIME SWITCH SHOWING: "A" - TAPPET, "B" - TIME DIAL, "C" - TIME INDICATOR, "D" - CONTACT

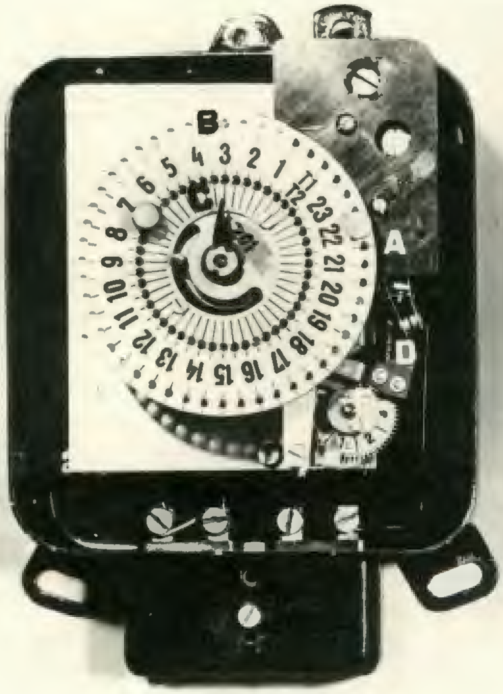


FIGURE 17

SIEMENS SCHUCKERT SSS TYPE TIME SWITCH WITH DAY WHEEL SHOWING:- "A" - TAPPET, "B" - TIME DIAL, "C" - TIME INDICATOR, "D" - CONTACTS, "E" - DAY WHEEL.

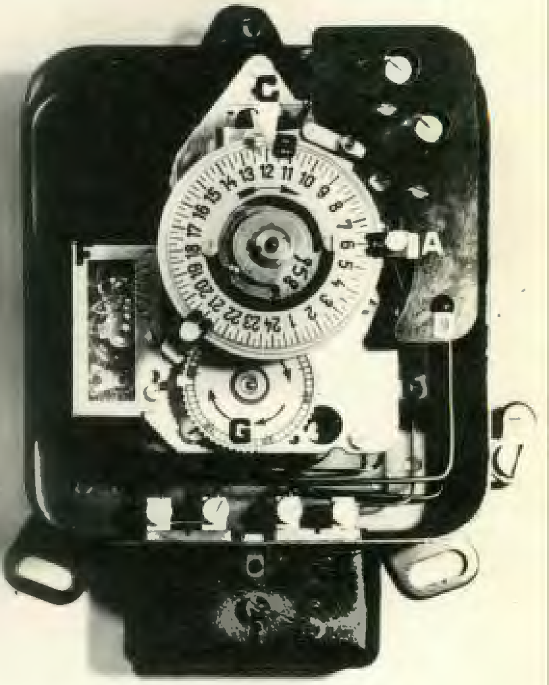


FIGURE 18

SIEMENS SCHUCKERT SSS TYPE TIM SWITCH WITH ESCAPEMENT SHOWING: "A" - TAPPET, "B" - TIME DIAL, "C" - TIME INDICATOR, "D" - CONTACTS, "F" - ESCAPE MENT, "G" - MINUTE DIAL.

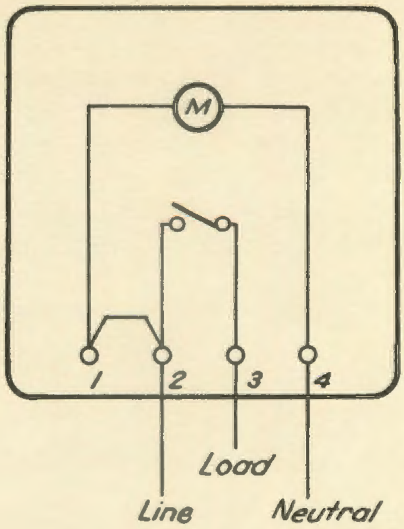


FIGURE 19

SIEMENS SCHUCKERT SSS STANDARD TYPE
TIME SWITCH CONNECTIONS

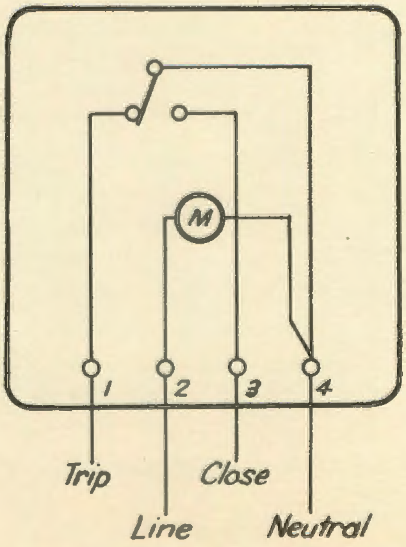


FIGURE 20

SIEMENS SCHUCKERT SSS LATCHING TYPE

WARBURTON FRANKI TYPE WF11 TIME SWITCH
(Figure 21)

Type

The Warburton Franki WF11 type time switch has a self-starting synchronous motor with an electrically or manually wound spring reserve which automatically goes into operation when supply is interrupted. The time switch is driven through differential gearing which permits normal synchronous operation or escapement operation when the synchronous motor is stopped. When supply is connected to the meter a thermal blocking device prevents operation of the escapement. The switch is single pole and is rated at 25 amperes, 240 volts. The time switch is enclosed in a rectangular case of black synthetic moulded material. The cover is fixed to the case by three sealing posts the upper one of which is also used for sealing the hinged window.

Time switches from and including S.C.C. No. 1123 differ slightly from earlier types. These are designated WF11-F1 and the principle modification is the omission of the escapement lock.

Time Dial (Figure 21 - "B")

The time dial is divided into day and night period setting out each hour of the day with subdivisions of fifteen (15) minutes and rotates in an anticlockwise direction. It is equipped with four tappets which provide for two switching on and two switching off operations daily. There are two small dials above the time dial, the one on the left being fitted with a second hand and the one on the right being fitted with a minute hand. These only operate when the time switch is running on spring reserve, and are useful when regulating the escapement.

When adjusting the time, the time dial must rotate in an ANTICLOCKWISE direction only, otherwise damage may result.

Time Indicator (Figure 21 - "C")

The pointer to indicate the time is a red arrow at the bottom right hand side of the time dial.

Inspection Apertures

Three inspection apertures are provided :-

1. An aperture is located in the left hand side of the nameplate through which one may observe the operation of the synchronous motor.

2. An aperture is located on the right hand side of the nameplate through which one may observe the position of the switch contacts.

3. An aperture is located inside the clock on the left hand side of the time dial, and the cover plate may be opened to observe the operation of the escapement.

Connections

The terminal block is located on the base and the connections are as shown in figure 21. A separate terminal cover is provided, inside which a diagram of connections is provided. There are no fuses in the motor circuit.

Setting of Tappets

Two "ON" and two "OFF" tappets are provided to give two switching on and two switching off operations per day. (Figure 21 - "A")

To set the tappets for one switching on and one switching off period per day, the following procedure shall be adhered to:-

(1) Loosen tappets by holding the time dial and at the same time turning the bakelite knob (left hand thread) in a clockwise direction as indicated by the arrow on the knob.

(2) Place the two tappets marked "ON" together at the time the time switch is required to close. Place the two tappets marked "OFF" together at the time the time switch is required to open.

(3) Lock the tappets in position by holding the time dial and at the same time turning the bakelite knob in an anticlockwise direction until the tappets are secured.

Installation

(1) Remove the terminal cover.

(2) Hang the time switch on meter board from one screw with the bracket fixed to the back of the case. Secure base with two screws in holes adjacent to the terminal block.

Due to the dial of this time switch being set back from the glass, it should be mounted not more than 6 feet from floor level to facilitate the checking of time.

(3) Connect the external wiring in accordance with the circuit diagram or with figure 21.

(4) Set time switch to correct time by turning the time dial anticlockwise until the correct time is indicated by the time pointer.

(5) With supply connected, check that the synchronous motor is running and then turn slotted shaft "Start" (top left corner) to the right to unlock the escapement, which should remain stationary. (When issued, the reserve spring is fully wound and the escapement locked).

Note: The portion of this clause relating to the slotted shaft does not apply to the WF11-F1 type time switch which is issued with the reserve spring fully unwound.

Manual Operation

(a) To close switch move the "ON" lever to the right.

(b) To open switch move the "OFF" lever to the right. These levers are located near the bottom of the window.

Manual Rewind

The main spring may be wound by screwdriver at the slotted staff on the right of the time dial. Approximately twenty-two (22) half turns are required to fully rewind. This operation should be performed only by a meter inspector.

Resetting Time Dial After Long Interruption to Supply

After an interruption to supply of more than approximately thirty hours the spring reserve mechanism will have completely unwound and the clock will have stopped. When supply is resotred the synchronous motor will start to operate the clock and also commence to rewind the spring. A full electrical rewind takes approximately twenty-two (22) hours. The officer checking the time switch after a prolonged interruption to supply should proceed as follows:-

(a) Check that the synchronous motor is running.

(b) Reset time dial till the correct time is opposite the red time pointer.

(c) Address a memorandum to the officer's Supervisor/M.S. requesting the re-setting of the escapement.

Changing Time Switch

When changing time switch due to some defect or for periodical overhaul proceed as follows:-

(1) Turn slotted shaft "Start" to the left to lock the escapement. (This does not apply to the WF11-F1 type).

(2) Remove the line, neutral and load leads from the terminal block, and then remove the time switch from the meter board.

(3) Affix the new time switch to the meter board and reconnect the line, neutral and load leads in their respective terminals.

(4) Check that synchronous motor is running, and then turn slotted shaft "Start" to the right to unlock the escapement. The second hand should remain stationary.

Note: The portion of this clause relating to the slotted shaft does not apply to the WF11-F1 type.

(5) Set time dial on correct time.

Sealing

The top cover and the terminal cover shall be sealed in accordance with Section 13 "Sealing and Labelling".

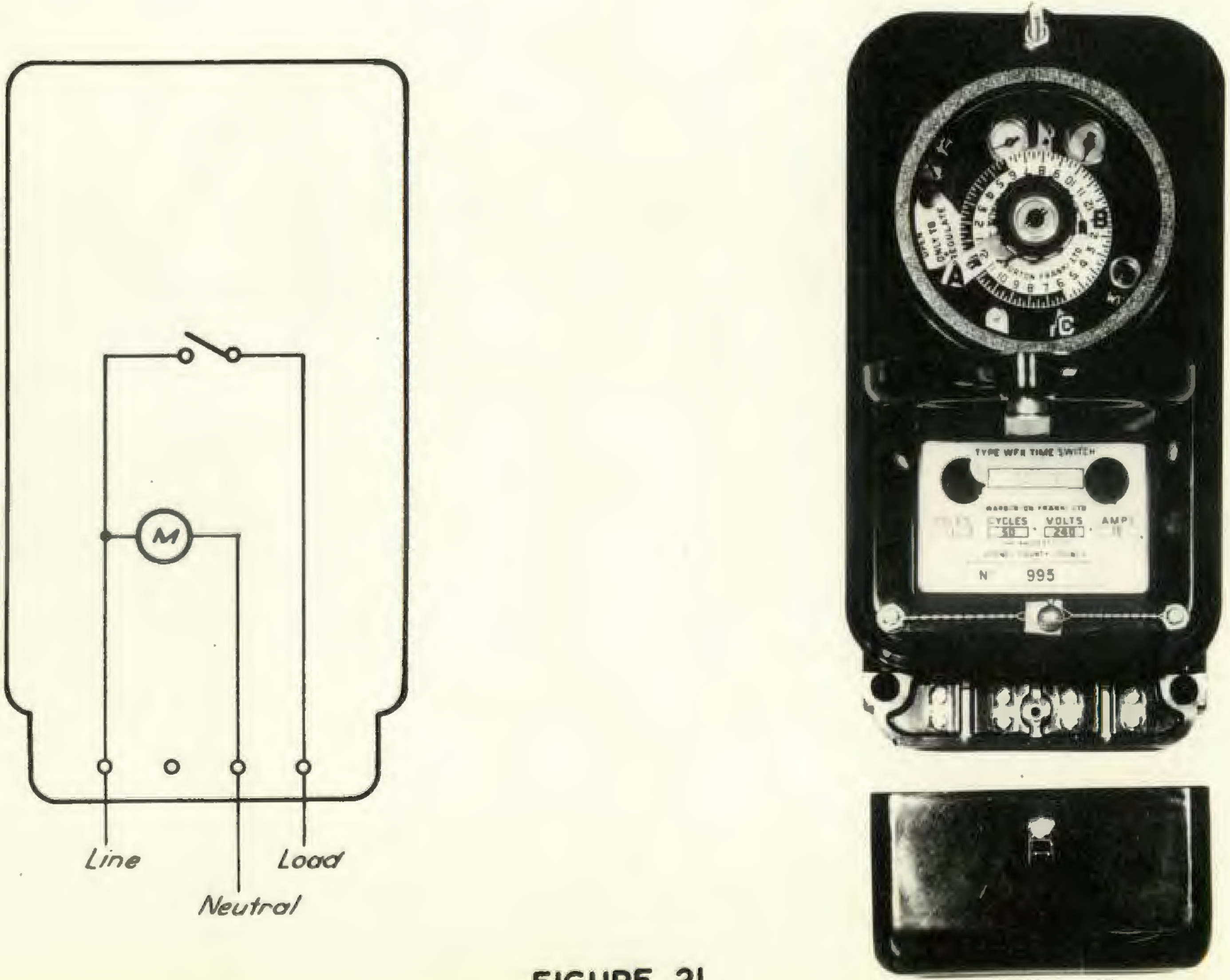


FIGURE 21

WARBURTON FRANKI TYPE WF 11 TIME SWITCH AND CONNECTIONS

WARBURTON FRANKI TYPE WF12 SPRING RESERVE SYNCHRONOUS TIME SWITCH

General Description

The time switch is provided with a self-starting synchronous motor, with an electrical and manually wound spring reserve, which automatically maintains operation when supply is interrupted. The drive is through differential gearing which permits normal synchronous operation, or escapement operation when the synchronous motor is stopped.

The spring driven mechanism is brought into operation by a thermal bimetallic starting device which on operation imparts a "kick" to the balance wheels to ensure reliable starting. Because of this action an escapement exercisor is not fitted.

The base is a black synthetic moulded material whereas the cover, a clear plastic, is completely detachable for access to the time dial and tappets. The cover is fixed to the base assembly by two sealing screws.

Specification

Single pole - Single dial Voltage 240V.
Rated Current 30A. (Resistive) 0.95 P.F.
Rewind Time 24 hours - Spring Reserve 24 hours.

Physical Dimensions

Height	226 mm	(8 7/8")
Width	124 mm	(4 7/8")
Depth	108 mm	(4 1/4")

Time Dials (Figure - 21D)

The time is shown on the hour dial by the red pointer and on a minute dial partly beneath and to the right of hour dial, by a black pointer marked on the assembly plate.

Inspection Apertures

1. The operation of the synchronous motor may be observed through the aperture to the left of the hour dial.

2. The position of the load contacts may be observed with cover in position (with some difficulty) through an aperture in the property plate.

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Connections

The connections are as shown in figure 21D.

Setting of Tappets

The operating times are set by tappets on the hour dial, having a point to indicate the time setting. The "ON" tappet is coloured silver and stamped "ON" whereas the "OFF" tappet is coloured brass and stamped "OFF".

Installation

(a) Remove the terminal cover.

(b) Fix time switch to meter board.

	Wooden Board	Composition Board
Top Fixing Lug	1 - 1" x 10G Round Head Steel Wood Screw	1 -¾" x 10G Self Tapping Binding Head Cadmium plated.
Bottom Fixing (Terminal Block)	1 - 1¼" x 7G Counter-Sunk Steel Wood Screw	1 -1½" x 5/32" Whit. Countersunk metal thread.

(c) Remove the clear plastic cover and turn the "wind" screw in the direction of the arrow at least ten complete turns, and note that the mechanism operates.

The mechanism cannot be overwound and it is not possible to feel when fully wound because it incorporates a slipping clutch.

(d) Connect the external wiring in accordance with the circuit diagram (figure 21D) and note that the synchronous motor operates and the spring mechanism stops.

(e) Set the time as follows:-

(i) Set the minute dial to 60 by rotating in clockwise direction

(ii) Set the hour dial on the hour mark of the preceding hour:- (i.e. at 2.35 p.m. Set at 2.00 p.m.)

(iii) Adjust the minute dial to the correct minute:- (i.e. at 2.35 p.m. set to 35.)

(f) Replace covers and seal.

Manual Operation

The contacts may be manually actuated by moving the white knob in the appropriate direction indicated by the arrows:-

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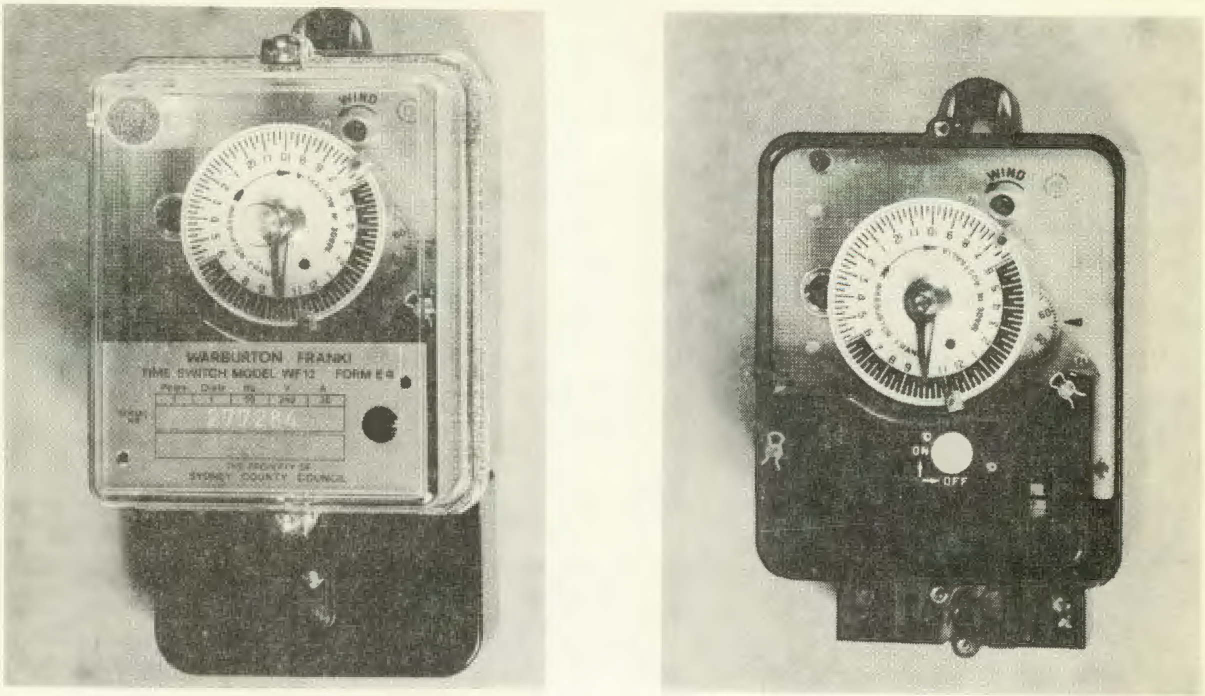


CONNECTIONS :-

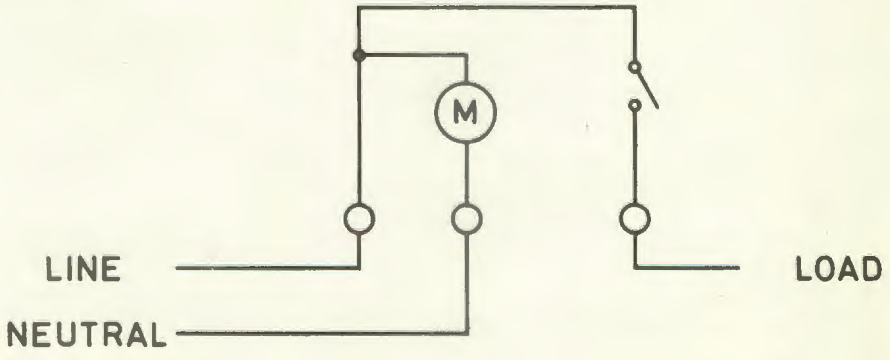


FIGURE 21 D

WARBURTON FRANKI TYPE WF 12 - (30 AMP. SINGLE POLE)
SPRING RESERVE SYNCHRONOUS TIME SWITCH

THE LANDIS AND GYR. 30 AMP. 2 POLE SPRING RESERVE TIME SWITCH, TYPE "KYB"

Type

The Landis and Gyr. "KYB" time switch has a self starting synchronous motor driving two time dials through intermediate gearing, and simultaneously winding the main spring of the reserve movement; for operating two 30 amp. single pole 240 volt switches. The two switches are each controlled by a separate time dial, enabling two 30 amp. loads to be switched at varying times.

The time switch is enclosed in a rectangular case of black synthetic moulded material, the internal mechanism cover is of clear plastic, is completely detachable and is fixed to the base by two screws, both of which are sealed by the Meter Superintendent. Access to the time dials and tappets is facilitated by the removal of an interlocking cylindrical inspection plate in the face of the cover.

Time Dials (Figure 21A)

The time dials are mounted one behind the other and rotate in a clockwise direction as indicated by an arrow on the dial. The hours are marked from one to twenty-four with ten minute sub-divisions. The night periods are indicated by a black semi circle on each dial.

Time Indicator (Figure 21A)

The red time pointer lowers vertically from the centre spindle of the dial. The pointer remains stationary, and as the dial rotates, the pointer indicates the time of the day.

Connections (Figure 21A)

A terminal block is located at the base of the time switch and six numbered terminals are provided, i.e. (1, 2, 3, 4: 7, 8:) and the connections are as shown in (Figure 21A), a stick-on circuit diagram is located inside the termihal cover.

A separate active and neutral supply shall be connected to the motor circuit (terminal 1 active and terminal 2 neutral) which is not fused internally and shall be taken from the same phase as that supplying Line 1 Terminal 3. Where necessary an opposite phase may be connected to Line 2 Terminal 7 to facilitate the control of two phase loads.

NOTE: The metal mounting bracket is provided with an earthing terminal, below the terminal block but as Council's metering equipment is not earthed, this shall not be used.

Setting of Tappets

The tappets are clamped to the edge of the time dials at the appropriate settings. The "on" tappet is coloured green and the "off" tappet is coloured blue. As the tappets are pre-set by the Meter Branch Staff before issue of the time switch, there shall ne bo need for them to be altered by officers of the Electrical Installation Branch.

The tappets fixed to the front time dial operate the switch connected to terminals 7 and 8 and the rear time dial tappets operate the switch connected to terminals 3 and 4.

Physical Dimensions

Length 9-5/8"	(224.48 mm.)
Width 5-3/4"	(146.05 mm.)
Depth 5"	(127.0 mm.)

Installation

1. Mounting

   (a) Wooden Boards: Secure the time switch to the meter board with three 5/8" x 8 gauge round head wood screws (Black Japan) in the metal mounting bracket.

   (b) Composition Boards: Secure the time switch to the meter board with three 1/2" x 10 gauge cadmium plated steel screws.

2. Connect external wiring in accordance with Figure 21A.

3. Loosen the sealing screw on the top right hand corner of the time switch cover and turn the clear circular interlocking inspection plate to the left and remove. Set time switch to the correct time of the day by turning dials clockwise until the time is shown against the read pointer. Both dials are synchronised so that if the front dial is set to time the rear dial is set to the same time.

4. Note the rotation of the synchronous motor through the aperture in the bottom left hand corner of the aluminium internal mounting plate.

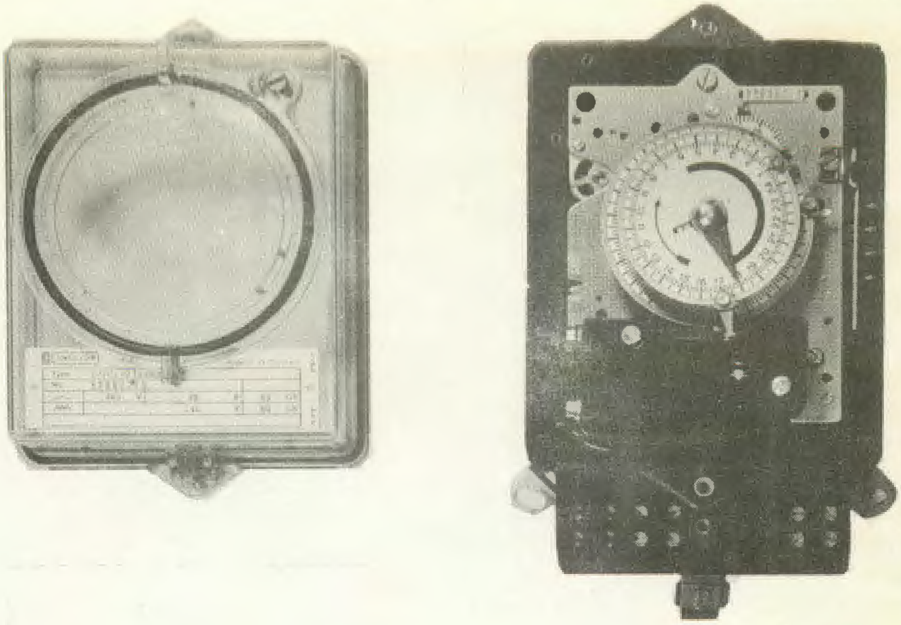
5. Replace covers and seal.

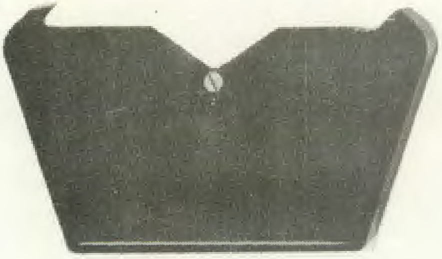
NOTE: The sealing screw on the inspection cover must be screwed down tight before sealing.

"Cutting In" Supply to Water Heaters

It has been customary when installing time switches for new water heaters to "cut in" and give immediate supply if the premises are occupied and hot water is required. However, with this time switch, it cannot be done without breaking Meter Branch seals and removing the front cover, therefore with the exception of hardship, sickness or where a hot water system is replacing an existing system (either electric, gas or other fuel), KYB type time switches shall be left operative at the correct time of day, which would generally leave the switches in the "off" position.

KYB type time switches shall be left in the "on" position for the above exceptions by removing the neutral conductor and rotating the time dials until the switches are in the closed position. When such action is taken, a I.126 Metering Request Form must be compiled requesting the replacement of the neutral conductor and the setting of the time switch to the correct time. This form must be drawn to the attention of the Foreman or Leading Hand on the same day. The Foreman or Leading Hand shall ensure that the job is issued to a Connecting Officer for replacement of the neutral conductor on the next working day.





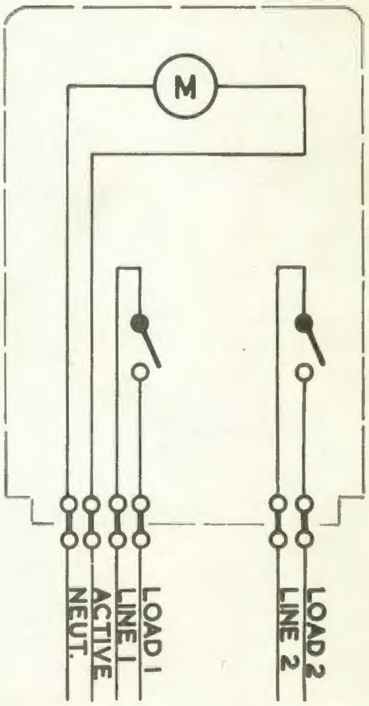


FIGURE 21A

LANDIS AND GYR.

30AMP 2 POLE SPRING RESERVE

TIME SWITCH

TYPE "KYB"

THE LANDIS & GYR. 15 AMP. 250 VOLT SINGLE POLE SPRING RESERVE TIME SWITCH, TYPE 2RD

Type

The Landis and Gyr. 15 amp. 250 volt 2RD time switch (LG2RD) has a self starting synchronous motor driving a time dial through intermediate gearing and simultaneously winding the main spring of the reserve movement; for operating two 15 amp. 250 volt series connected switches, and is used principally in connection with the Landis and Gyr. two rate - energy demand direct connected and current transformer metering.

The time switch is enclosed in a rectangular case of black synthetic moulded material. The internal mechanism cover is completely detachable and is fixed to the body-case by two screws, both of which are sealed by the Meter Superintendent. Access to the time dial and tappets is facilitated by the removal of an interlocking cylindrical inspection plate of clear plastic in the face of the cover.

Time Dial (Figure 21B)

The time dial rotates in a clockwise direction as indicated by an arrow on the dial. The hours are marked from one (1) to twenty-four (24) with fifteen (15) minute sub-divisions. The night period is indicated by a black semi circle on the dial.

Time Indicator (Figure 21B)

The red time pointer rises vertically from the central spindle of the dial. The pointer remains stationary and as the dial rotates, the pointer indicates the time of the day.

Connections (Figure 21B)

A terminal block is located at the base of the time switch and four terminals are provided for connection as shown in (Figure 21B). A stick-on circuit diagram is located inside the terminal cover.

The motor circuit is supplied with a separate active and shall be connected to the same phase as the register and demand coils of the associated meter in both direct connected and current transformer metering. See Section 11, Page 23, Clause 3(c), "Time Switches" of the Metering Instruction Book regarding the provision of an additional active link and the method to be adopted when installing time switches in conjunction with two rate current transformer connected meters.

NOTE: When the modified LG/ML ED2R meter is used for single rate energy demand operation, the LG. 2RD time switch is still required for the external timing of the half-hour demand interval.

410.0
ELECTRICAL INSTALLATION BRANCH

Sup.M./DES
Ext. 7152

15th September, 1970.

METERING MEMO TO FOREMEN, LEADING HANDS, CONNECTING OFFICERS, METER FIXERS, ELECTRICAL FITTERS AND APPRENTICES

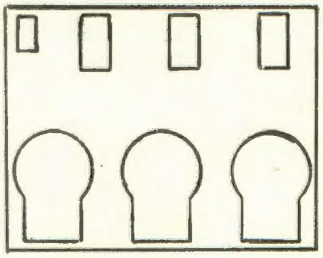
Copies to: M.S.S. (20) and Planning Clerks.

USE OF 18" x 21" WIDE BOARD FOR 3 AND 4 WIRE SERVICE AND METERS

The 18" x 21" wide board which is specifically for the mountin of the 100/400 amp. distribution service cabinet, may be used for servic and metering purposes only in those existing installations where it is unreasonable to request the enlarging of a recess or cabinet.

Examples of the maximum permitted use of this board are shown below:-

1.



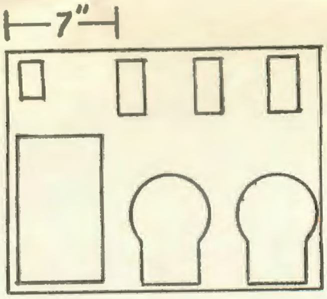
4 Wire Service

Total of 3 single phase meters or 2 meters and a single phase time control unit.

3 Wire Service

A single phase time control unit may be added to the previousl mentioned arrangement.

2.

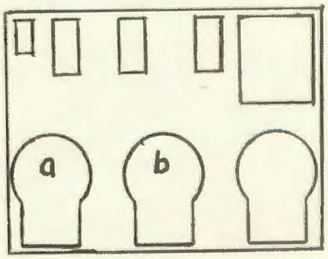


4 Wire Service

A total of one polyphase meter and either two single phase meters or one single phase meter and a single phase time control unit.

N.B. A space of 7" must be allowed between the left side of the board and "A" phase service fuse to allow space for polyphase meter.

3.



4 Wire Service

A total of 3 single phase meters and a single phase time control unit.

This arrangement will not be marked by the Service Marker but will be referred to the appropriate F.I.I.

The F.I.I. shall, where possible, use a 2 phase meter in lieu of meters "a" and "b" and arrange as shown in example 2. Otherwise he may arrange as above by moving the fuses as near to the left side as possible.

F. R. Clarke

SUPERVISOR METERING

Setting of Tappets

The tappets are clamped to the edge of the time dial at the appropriate settings. As the tappets are pre-set by the Meter Branch Staff before issue they shall not be altered by officers of the Electrical Installation Branch.

Physical Dimensions

Length	8-15/16"	(227.01 mm.)
Width	5-3/4"	(146.05 mm.)
Depth	5-1/8"	(130.18 mm.)

Installation

1. Mounting

   (a) Wooden Boards: Secure the time switch to the meter board with one 5/8" x 8 gauge round head wood screw in the top metal mounting bracket and with two 1" x 6 gauge countersunk wood screws in the two fixing holes adjacent to the terminal block.

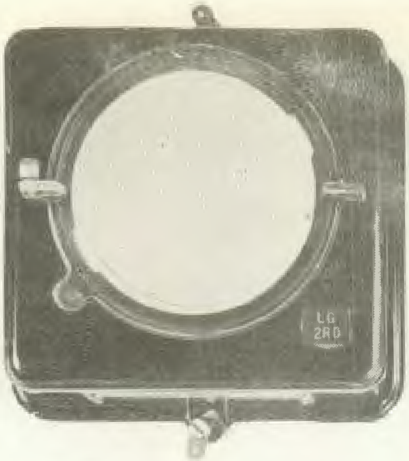
   (b) Composition Boards: Secure the time switch to the meter with one 1/2"x 10 gauge cadmium plated, self tapping steel screw in the top metal mounting bracket and with two 3/32" Whitworth metal threaded screws and nuts in the base.

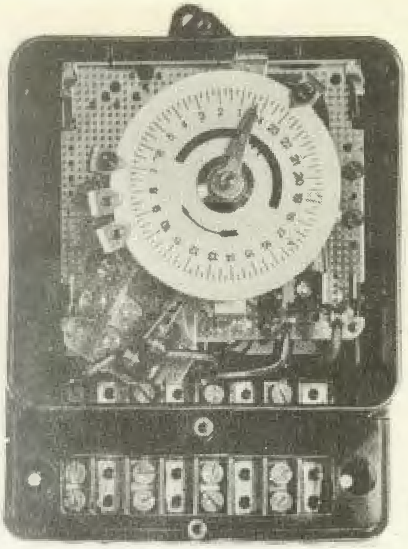
2. Connect the external wiring in accordance with circuit diagrams 29, 29A, 30 and 30A for current transformer metering and circuit diagram 25A for direct connected metering as appropriate. Turn the clear, circular interlocking inspection plate to left and remove.

3. Set time switch to the correct time of the day by turning the dial clockwise until the time is shown against the red pointer.

4. Note the rotation of the synchronous motor through the aperture in the bottom left-hand corner of the aluminium internal mounting plate.

5. Replace covers and seal.





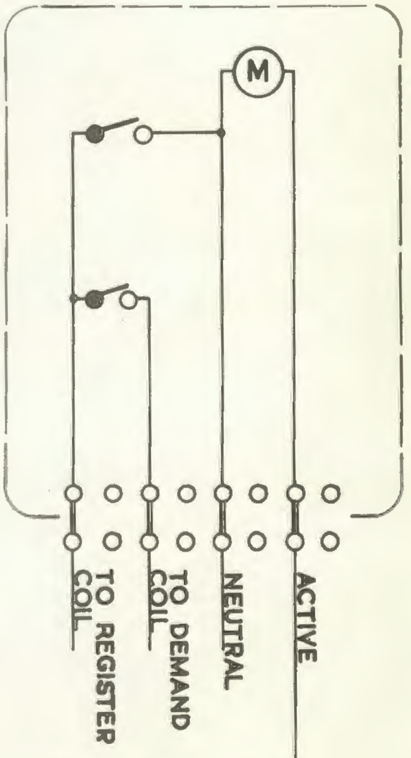


FIGURE 21 B

LANDIS AND GYR.

15 AMP. 250 VOLT.

SINGLE POLE SPRING RESERVE

TIME SWITCH TYPE L.G. 2RD.

FOR DIRECT CONNECTED METERING SEE CIRCUIT DIAGRAM 23	TO SERVICE FUSE OR LINE SIDE OF MAIN SWITCH. SAME AS LINE 1.
FOR CURRENT TRANSFORMER METERING	TO APPROPRIATE ACTIVE LINK OR IF CONTROLLED BY A SWITCH, TO SERVICE FUSE OR LINE SIDE OF MAIN SWITCH.

THERE MUST BE ONLY ONE PHASE USED IN TIME SWITCH

THE LANDIS & GYR 15 AMP. 250 VOLT SINGLE POLE SPRING RESERVE TIME SWITCH, TYPE LG

Type

The Landis and Gyr 15 amp. single pole time switch has a self starting synchronous motor driving a time dial through intermediate gearing and simultaneously winding the main spring of the reserve movement for operating one 15 amp. 250 volt switch and is used principally in connection with the two rate direct connected; and current transformer metering and with switching controlled loads with contactors in non relay areas.

The time switch is enclosed in a rectangular case of black synthetic moulded material. The internal mechanism cover is completely detachable and is fixed to the body-case by two screws, both of which are sealed by the Meter Superintendent. Access to the time dials and tappets is facilitated by the removal of an interlocking cylindrical inspection plate of clear plastic; in the face of the cover.

Time Dial (Figure 21C)

The time dial rotates in a clockwise direction as indicated by an arrow on the dial. The hours are marked from one to twenty-four (1-24) with fifteen (15) minute sub-divisions. The night periods are indicated by a black semi circle on the dial.

Time Indicator (Figure 21C)

The red time pointer rises vertically from the centre spindle of the dial. The pointer remains stationary, and as the dial rotates, the pointer indicates the time of the day.

Connections (Figure 21C)

A terminal block is located at the base of the time switch, with four terminals for connection as shown in figure 21C.

A stick-on diagram of connections is located on the inside of the terminal cover. The motor circuit is supplied with a separate active and neutral and shall be connected to the same phase as that supplying the Register Coil of the associated two rate meter in both direct connected and current transformer metering. See Section 11, Page 23, Clause 3(c) "Time Switches" of the Metering Instruction Book; re the provision of an additional link and the method to be adopted when installing time switches in conjunction with two rate current transformer connected meters.

Setting of Tappets

The tappets are clamped to the edge of the time dials at the appropriate settings and are preset by the Meter Branch Staff prior to issue. They shall not be altered by officers of the Electrical Installation Branch.

Physical Dimensions:

Length	8-15/16"	(227.01 mm.)
Width	5-3/4"	(146.05 mm.)
Depth	5-1/8"	(130.18 mm.)

Installation

1. Mounting

   (a) Wooden Boards: Secure the time switch to the meter board with 1 x 5/8" x 8 gauge round head wooden screw in the top metal mounting bracket; and with 2 x 1" x 6 gauge counter sunk wood screws in the two fixing holes adjacent to the terminal block.

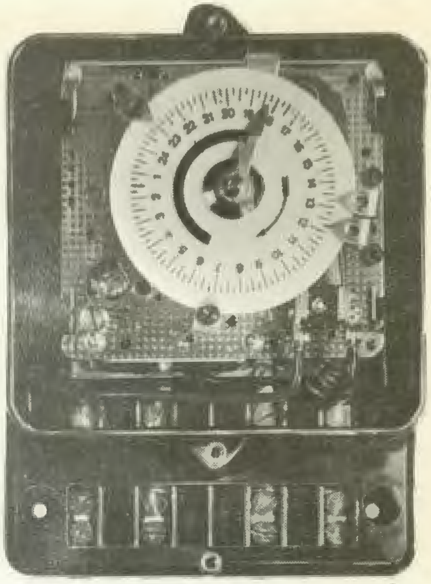
   (b) Composition Boards: Secure the time switch to the meter board with one 1/2" x 10 gauge cadmium plated, self tapping steel screw in the top metal mounting bracket and with two 3/32" Whit metal threaded screws and nuts in the base.

2. Connect the external wiring in accordance with circuit diagrams in Section 25 for current transformer and direct connected metering as appropriate.

3. Turn the clear circular interlocking inspection plate to the left, remove, set time switch to the correct time of the day by turning dial clockwise until the time is shown against the red pointer.

4. Note the rotation of the synchronous motor through the aperture in the bottom left hand corner of the aluminium internal mounting plate.

5. Replace covers and seal.



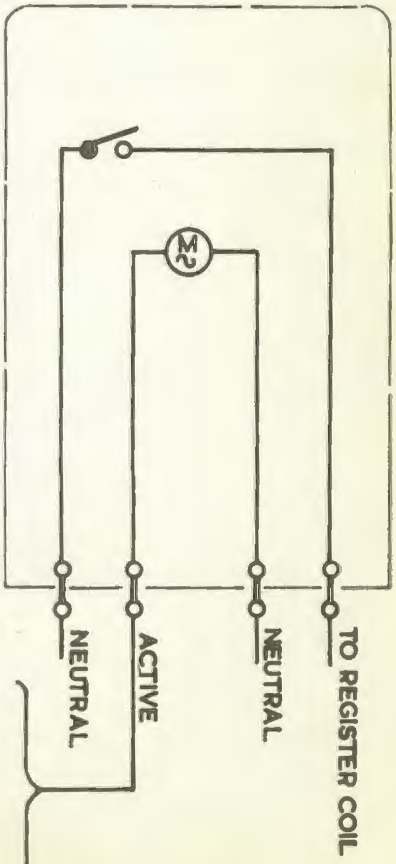


FIGURE 21C

LANDIS and GYR

15 Amp 250 Volt

SPRING RESERVE TIME SWITCH

TYPE LG.

FOR DIRECT CONNECTED METERING SEE CIRCUIT DIAGRAM 23 — TO SERVICE FUSE OR LINE SIDE OF MAIN SWITCH SAME AS LINE I

FOR CURRENT TRANSFORMER METERING — TO APPROPRIATE ACTIVE LINK OR IF CONTROLLED BY A SWITCH TO SERVICE FUSE OR LINE SIDE OF MAIN SWITCH

THERE MUST BE ONLY ONE PHASE USED IN TIME SWITCH

A.T.M. RHYTHMATIC CONSUMER LOAD CONTROL EQUIPMENT

Principles of Operation

This system employs an audio frequency current which is applied to the 11 kV network. The signal passes through this network, and is stepped down through the 11 kV/415-240 volt distribution transformers; it then passes through the low voltage network to actuate relays installed at customers' premises.

The relays are tuned to operate at the control frequency and for a particular pulse rate or rhythm. The system provides for the transmission of sixteen different rhythms or signals.

The audio frequency current, generated at 760 cycles by a three phase inductor type alternator, is applied to the 11 kV network through an isolation transformer, inductor and capacitor. The capacitor has a high 50 cycle impedance thus passing only a small current at this frequency. The inductor-capacitor, which is series connected and adjusted to series resonance at the control frequency, has a low impedance and so permits the injection of the audio frequency current into the 50 cycle system.

The audio frequency current is, in effect, only the signal carrier, the actual signal discrimination being in the rate of the pulsing current. This pulsing is effected by a contactor. During signal injection the contactor opens and closes at a rate determinated by the pulse rate of the signal selected.

Receiving Relays (Figure 22)

The relay is assembled in a moulded case designed to have approximately the same base area as the SSAO type time switch and projects 6⅜" from the face of the meter board.

The relay case consists of a moulded base upon which is mounted the mechanism. A rear cover is fitted, which is only accessible for removal before the relay is mounted on the board but in any case must not be removed by Inspection Branch officers. A front cover is accessible for removal when relay is in position and may be removed for manual operation.

The terminals are protected by a separate cover and a metal plate is fixed to the base of the relay for mounting purposes.

These relays include a primary filter which accepts current at the control frequency while virtually rejecting the 50 cycle current.

Each relay is provided with two pivoted galvanometer assemblies, which respond to different rhythms. They can therefore discriminate between two specific control signal pulse rates, and thus separately act upon the "on" and "off" coils of the load control switch.

The relay load control switch is rated at 15 amperes, 240 volts.

Installation

Fix the relay to the meter board with three screws through the metal mounting bracket. When mounted on composition panels as in the Bankstown area, Rawlnuts may be used to enable the fixing to be carried out from the front and to absorb shock.

Remove the triangular shaped terminal cover. The two cover screws are drilled for sealing.

Connect the conductors as shown in figure 22.

Manual Operation

It may be found that when issued, the relay is in the "ON" position. If not, it may be operated manually as follows:-

1. Break "MS" seal on front cover.
2. Unscrew the three front cover screws and remove cover. The cover is fitted with a plastic dust seal which may adhere to the base, making the cover difficult to remove. Gentle bumping should free it. Should it be found necessary to use a knife under the edge of the cover, extreme care must be exercised. Should the knife slip, the cover and the internal mechanism may be damaged.
3. Operate the 15 ampere latching switch by pushing in the right side of the armature with a pencil. (marked "A" in figure 22).
4. Replace the cover and seal in accordance with Section 13, "Sealing and Labelling".

To Bridge Relay

"Trip in" relay and remove neutral conductor, unless the mechanism and contacts are damaged, then the line and load conductors should be withdrawn, connected together and taped.

Alteration of Settings

The settings of these relays must not be altered by Inspection Branch officers. All requests for alterations must be referred to the Meter Branch.

Warning. Before working on circuits controlled by these relays, the switch controlling the circuit must be opened, as the relays may be operated from the control centre at any time during the day or night.

Sealing

The front cover may be equipped with either of two types of sealing device.

(a) With one type, the sealing screw is of the short type and the sealing wire must be entered through the sealing hole in the sealing screw before the front cover is replaced. On replacing the cover, the screws are tightened up, care being taken not to break the sealing wire. The wire is then fed through the adjacent sealing lug and sealed in the usual manner.

(b) With the other type, the sealing screw heads extend above the front surface of the front cover, as does the sealing lug, and sealing is carried out in the usual manner.

The terminal cover is sealed by passing the sealing wire through the two fixing screws and sealed in accordance with Section 13 "Sealing and Labelling.

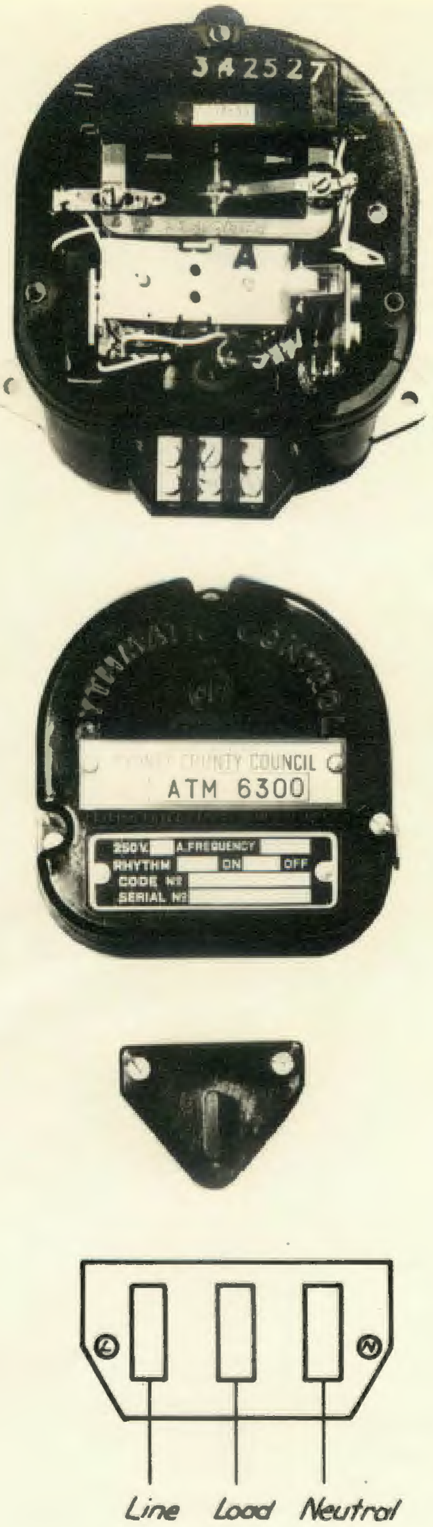


FIGURE 22

A.T.M. TYPE RYTHMATIC CONTROL RELAY SHOWING ARMATURE "A" AND CONNECTIONS

WARBURTON FRANKI - TYPE WF12P (PLUG-IN) SPRING RESERVE SYNCHRONOUS TIME SWITCH

The basic construction and operation of the plug-in version of the Warburton Franki Type WF12 time switch are similar to the bottom-connected WF12 unit, except for the synthetic moulded case and terminal connections. The plug-in unit is designated as WF12P.

SPECIFICATIONS

Single pole, single dial, 240V, 50 Hz, rated current 30A (resistive), rewind time 24 hours, spring reserve 22 hours - "Plug-in" design.

CASE

The time switch moulding has been designed to perform two functions - housing the mechanism and providing the cover for the socket base.

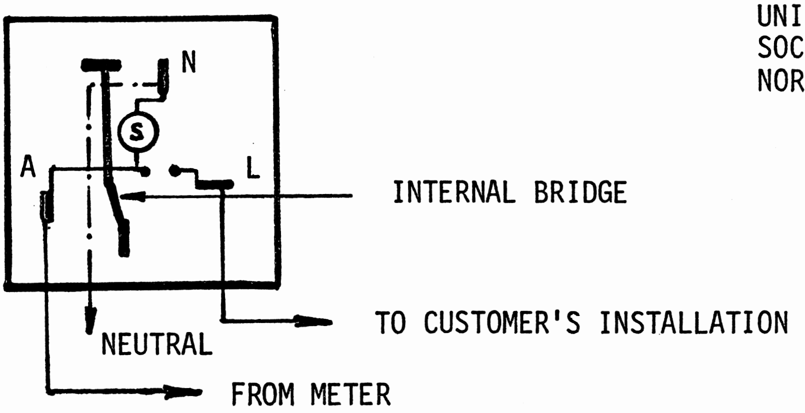
Five contact blades protrude through the moulding and are protected from inadvertent contact.

The two sealable fixing screws provided in the moulding are captive. It is necessary to unscrew them and reinsert them in the other two corners if the unit is rotated to the "by-pass" position.

The detachable clear cover incorporates an internal plastic container (top left hand corner) for the storage of a spare fixing screw. It is attached by two sealable fixing screws. These are not interchangeable with those used to secure the unit in the socket base.

CONNECTIONS

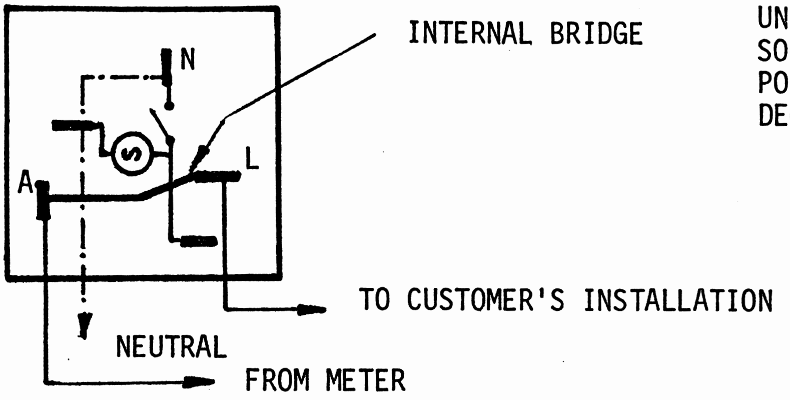
The contact blades are connected internally as shown in diagrams 1 and 2.



UNIT PLUGGED INTO
SOCKET BASE IN
NORMAL POSITION.

DIAGRAM 1.

When the unit is plugged into the socket base in the normal position, the switch circuit is located between the "A" and "L" terminals. Should the unit be inoperative or defective, and it is necessary to maintain supply to the customer, the unit may be rotated 90 degrees anticlockwise and plugged into the socket base. This results in an internal "by-pass" being connected between the "A" and "L" terminals, thus providing uncontrolled supply until the unit is replaced.



UNIT PLUGGED INTO
SOCKET BASE IN "BY-PASS"
POSITION - ROTATED 90
DEGREES TO LEFT.

DIAGRAM 2.

GENERAL INFORMATION

The time dials, inspection apertures, manual operation, winding of spring reserve mechanism, and resetting procedure are the same as that previously outlined for the WF12 Time Switch (bottom-connected).

SEALING

The sealing of the unit shall be as outlined in Section 13.

CONSUMER LOAD CONTROL RECEIVING RELAYS

ZELLWEGER 750 Hz SYSTEM

The following Zellweger C.L.C. receiving relays are used on the Council's system:-

Type ZEQ22/1. This is an electro-mechanical relay with a single load control switch rated at 25A, 240V.

Type ZE22/3 and ZE22/2. These are also electro-mechanical relays but have three and two load control switches respectively, each rated at 25A, 240V.

Type ZE22/3 (Modified). This is a ZE22/3 relay which has been modified for single phase only. They are identified by the red adhesive label on the property plate, and are numbered in sequence commencing 318001.

Type RE1 (Decabit). This is a solid-state electronic relay with a single pole load control switch rated at 40A, 415V.

1. PRINCIPLE OF OPERATION

1.1 22 Channel System. Motor generator sets installed in various zone substations are used to generate 750 Hz current which is injected into the 11kV distribution network in a number of coded pulses, described as a transmission, over a period of three minutes. Consumer load control relays installed at various customers' premises are set to respond to the various commands produced by selecting different combinations of "on" and "off" periods. A complete series of pulses is injected during each transmission. A typical 22 channel system transmission is illustrated below.

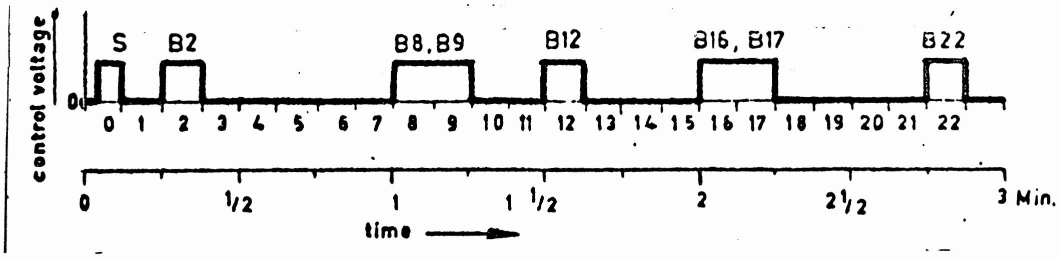


DIAGRAM SHOWING A TRANSMISSION WHICH SWITCHES "ON" OR LEAVES "ON" ALL RELAYS SET ON CHANNELS NUMBER 2, 8, 9, 12, 16, 17 AND 22 AND SWITCHES "OFF" OR LEAVES "OFF" ALL RELAYS SET ON THE OTHER CHANNELS.

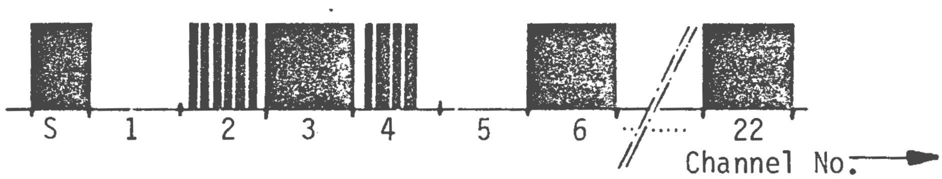
The time interval between the end of the start pulse and the end of the three minute transmission is divided into 22 equal parts, each of which is termed a "channel". If it is desired to switch the relays for a particular channel "on" or to leave them switched "on", a pulse is transmitted during the interval of time allotted to that channel. If, however, it is desired to switch these relays "off" or to leave them switched "off" no pulse is transmitted during the relevant time interval for that channel.

The first pulse of any transmission is known as the "start pulse" as it performs the function of switching on a small synchronous motor in each relay. This motor is fed from the distribution network and drives the timing mechanism drum. The transmitting device is also driven by a motor supplied from the same network, so that synchronism between the transmitter and the receiving relay during the period of transmission is assured.

1.2 Decabit. The decabit system operates in conjunction with the 22 channel system and utilises the same 750 Hz frequency injection system. Various channels of the 22 channel system have been allocated for the transmission of decabit commands. A typical diagram of a decabit transmission is shown below. Each coded command is composed of 11 adjacent time slots, each of 600 milli-seconds.

The transmission commences with the injection of the "start" pulse which alerts all receivers to decode the message contained in the next ten time slots. Every code sequence consists of five time slots in which pulses are transmitted and five slots in which no pulse is transmitted, giving a total of ten "bits" of information arranged in various combinations and accounting for the name "DECABIT".

Command selection on the receivers is done by means of an interchangeable code card.



TYPICAL DIAGRAM OF A MIXED DECABIT
AND 22 CHANNEL SYSTEM TRANSMISSION

2. CHANNEL SELECTORS

2.1 ZEQ22/1 Relay. The channel selector may be observed through the top left side aperture in the cover and consist of a dial on the end of the timing mechanism drum, divided into 22 channel spaces with an indicating arrow visible in the centre of the aperture indicating the selected channel.

Any particular channel may be selected by rotating the numbered ring anti-clockwise.

2.2 ZE22/3 and ZE22/2 Relays. The three channel selectors may be observed through the top section of the observation window in the cover above the name plate and consist of discs of cream coloured bakelite mounted in the vertical plane on the timing mechanism drum and each provided with 22 numbered positions. A horizontal white line on the centre of the brown bakelite timing mechanism drum indicates the channel selected. The required channel may be selected by rotating the numbered bands downward so that the pointer is against the required channel number. There is a separate channel selector for each pole of the relay and these operate independently.

2.3 RE1 (Decabit) Relay. The command code to which the relay will respond is determined by the number displayed on the code card which can be seen through the clear cover. The relay is issued complete with a code card and this must not be removed in the field. Consequently, it is necessary to replace the relay if a change in the "on" period is required.

3. LOAD SWITCHES

3.1 ZEQ22/1 Relay. The load switch manual operating toggle is coloured yellow and may be observed through the bottom left side window in the cover. The switch is in the "on" position when the yellow toggle coincides with the red dot.

ZE22/2 and ZE22/3 Relays. The switch manual operating toggles are coloured yellow and may be observed in the bottom section of the observation window in the cover, below the nameplate. The "on" and "off" positions are indicated to the left of the switch toggles.

RE1 (Decabit) Relay. The load switch is operable manually. The operating toggle may be observed through the clear cover and the "on" and "off" positions are clearly indicated.

4. PROCEDURE FOR SELECTING CHANNEL ON ZEQ AND ZE22/3 AND 22/2 RELAYS

4.1 General. The appropriate channel for the controlled load tariff shall be selected by field staff when the relay is installed, or an alteration is required.

Special care should be taken in the following respects:-

(a) Wipe off any dust from the top of the housing.

(b) Remove the cover squarely so that it does not catch on any object.

(c) Note the exposed live terminals beneath the switch toggles of the ZE22/2 and 22/3 relays and avoid inadvertent contact.

(d) Check with test lamps that -

i) the centre spindle of the channel drum of the ZEQ22/1 relay or

ii) the metal sides of the ZE22/2 or ZE22/3 relays are not energised

4.2 ZEQ Relay.

i) Remove cover to expose Channel Switching Disc, then rotate switching disc in an anti-clockwise direction until the desired channel number corresponds to the pointer on the inner side of the channel numbers.

ii) Ensure that the relay switch is left in the "on" position.

iii) Replace and seal covers.

4.3 ZE22/2 and 22/3 Relays

i) Remove the cover from the body of the relay, avoiding inadvertent contact with exposed live terminals.

ii) Remove the clear plastic cover which is held in position by a spring clip.

Note that the drum on which the channel switching discs are mounted finishes each cycle with a white indicator to the front. The single pole load switches operate independently according to the channels selected on the switching rings.

iii) Having selected the pole associated with supply to a particular tariff or customer, the change of channel is effected by pulling downwards on the switching ring until the required channel number is aligned with the white indicator. The channel switching ring should then be pushed slightly in the opposite direction to ensure that the latching spring is locked in position.

iv) Leave the switches in the "on" position.

v) Replace and seal covers.

5. CONNECTIONS

5.1 ZEQ22/1 Relay. The terminal block is located within the base and the connections are as shown in figure 23. A separate terminal cover is provided, with one sealable fixing screw.

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The motor and pulse receiving circuit are fused internally (see figure 23) and are supplied from terminals 1 (active) and 2 (neutral). Terminal 1 is also the active connection to the load switch control contacts.

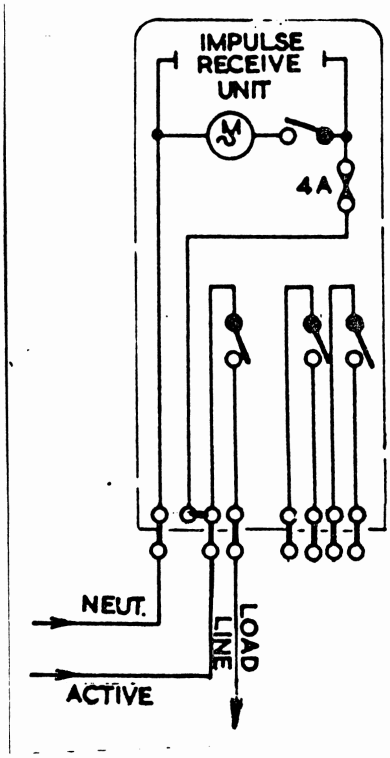
5.2 ZE22/2 and ZE22/3 Relays. The terminal block is located within the base and the connections are as shown in figure 24. A separate terminal cover is provided with one sealable fixing screw.

On the inside of the terminal cover is located a "stick-on" diagram of connections. The motor and pulse receiving circuit are fused internally (see figure 24) and are supplied from the first (active) and second (neutral) left side terminals (see figure 24).

Where this relay is installed close to the service fuse, the supply to the synchronous motor active terminal shall be taken from the load side of the service fuse or active metering link. See Diagram 3E, Section 25.

In a polyphase installation, care shall be taken to ensure that supply to the synchronous motor circuit active terminal on the relay is taken from the same phase as the supply to the immediately adjacent active terminal.

5.3 ZE22/3 (Modified) Relay. The connections to the modified relay are depicted in the following diagram.



Connections to ZE 22/3 Relay
(Modified)

It should be noted that the position in the terminal block normally occupied by the second terminal is vacant and an internal "by pass" has been fitted between the line side of the channel switch and the motor terminal.

Cable connections are only to be made at the first three left-side terminals and should be in the sequence of neutral, line and load, left to right.

5.4 RE1 (Decabit) Relay. The RE1 relay has three terminals incorporated in the terminal block at positions numbered 2, 3 and 4 and position 1 is not used. External connections shall be made in accordance with the connection diagram on Figure 24A.

It is important to note that the order of the terminals differs from that in the relay type ZEQ22/1 and the WF12 time switch.

6. APPLICATION

6.1 General. RE1 relays shall be used in preference to ZEQ22/1, ZE22/2, ZE22/3 and ZE22/3 (Modified) relays to control 6, 9 and 10 hour heating-period loads in all areas where socket metering is not applicable and satisfactory 22 channel signals are received, with the following exceptions:

Bankstown area zones excepting Punchbowl, all Southern Area zones, North Sydney, Waverley and Berowra zones.

Maps defining these areas are maintained in Area Branch depots.

The use of 22 channel system relays (that is ZEQ22/1, ZE22/2, ZE22/3 and ZE22/3 (Modified) shall be confined to cases where a type RE1 relay would not be suitable due to lack of signal or to the requirement of a heating period exceeding 10 hours. Also, a ZE22/2 or 22/3 relay may be used in an existing installation with bottom-connected metering, where an addition involves the installation of a C.L.C. relay and the use of a 2 or 3 pole relay is necessary to fit within the space available on a meter board.

In all other cases and in any new installations, if the controlled load exceeds 25A or involves the switching of more than one phase of supply, Service Rule 3.9 requires that the customer shall provide and install a contactor arranged so that it is operated by the Council's control device. Separate single pole control devices will be installed for each separate customer unless, in the case of a multiple installation, the builder or developer proposes to reduce the number of control devices. The latter will be agreed to provided he makes provision for at least two control devices and installs the necessary contactor(s).

Where different heating periods apply to separate portions of a customer's installation in accordance with the conditions of the tariffs selected, one control device only will be installed for any heating period up to 10 hours. A second control device will be installed if 2 heating periods apply and either of them is in excess of 10 hours.

6.2 Decabit Commands Providing 6 hour heating periods. Three decabit command codes designated decabit 12, 13 and 14 give the same 6 hour "on" period as channels 12, 13 and 14 respectively of the 22 channel system. The RE1 relays responding to these command codes are supplied with code cards marked RE102-12, RE102-13, and RE102-14. They are despatched from the E.I. Branch in cartons of 30 relays with equal numbers of each code and should be installed on a random basis.

6.3 Decabit Commands providing 9 and 10 hour heating periods. Three decabit command codes designated decabit 04, 07 and 09 give the same 10 hour and 9 hour "on" period as channels 4, 7 and 9 respectively of the 22 channel system. The RE1 relays RE100-04, RE100-07 and RE100-09, are packed in cartons of 30 relays all of which have code cards of the same number and must not be installed at random. The command code identification must be specified when ordering these relays for despatch to area Meter Store.

6.4 Replacements. The use of RE1 relays as replacements for time switches and other relays shall be in accordance with Table 1.

TABLE 1

EXISTING C.L.C. DEVICE	CODE CARD OF REPLACEMENT RELAY
Relay on Channel 4 of 22 channel system or a time switch set to a 9 or 10 hour period starting before 9.00 p.m.	RE100-04
Relay on Channel 5, 6 or 7 of 22 channel system and a time switch set to a 9 hour period starting at 9.00 p.m. up to 10.00 p.m.	RE100-07
Relay on Channel 8 or 9 of 22 channel system or a time switch set to a 9 hour period starting after 10.00 p.m.	RE100-09

7. INSTALLATION

7.1 Types ZEQ22/1, ZE22/2, ZE22/3 and ZE22/3 (Modified). These shall be installed as follows:-

i) Remove terminal cover.
ii) Secure the relay housing to the meter board or panel using fixings as set out in Table 2.
iii) Connect the external wiring in accordance with the circuit diagram. (Due to the closeness of terminals the connection should not be done with live conductors).
iv) Replace cover and seal in accordance with Section 13.

Note: The necessary 2.5mm^2 (stranded) cable connection to the motor circuit active terminal is supplied by the Council.

7.2 RE1 (Decabit) Relay. This shall be installed in a manner similar to that described in 7.1 and in accordance with the following:-

i) Secure the relay housing to the meter board or panel.
ii) Identify each of the conductors and connect them in accordance with Figure 24A.
iii) Replace the terminal cover and pass a tinned copper wire through both the sealing facility provided on the terminal cover and that on the lower portion of the clear cover. Complete the sealing in accordance with Section 13.
iv) The RE1 relay load switch is set in the closed position prior to despatch and shall be left in this position when installed. Under no circumstances shall any component including the code card, be removed or adjusted in the field and relays suspected of being defective must be tagged and returned to the E.I. Branch. Under normal circumstances, there will therefore be no justification for removing the relay cover.

NOTE: It is important to note that the order of the terminals differs from that in the relays type ZEQ and the WF12 time switch.

TABLE 2

MEANS OF *FIXING RELAYS TO PANEL

RELAY TYPE	PANEL MATERIAL					
	PLYWOOD		COMPOSITION (10mm)		LAMINATED PHENOLIC (6mm)	
	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM
ZEQ22/1	12 x 10G	20 x 10G	12 x 10 Gauge	12 x 10 Gauge	12 x 10 Gauge	12 x 10 Gauge
ZE)22/2)22/3	25 x 10G	20 x 6G	3 Insulated-Head Metal Thread Screws and Nuts			
RE1 (DECABIT)	16 x 10G	16 x 10G	16 x 10G	16 x 10G	12 x 10X	12 x 10G

*ROUND HEAD WOOD SCREW OR CADIUM OR ZINC-PLATED SELF-TAPPING STEEL SCREW UNLESS OTHERWISE STATED.

7.3 Order of Connection and Labelling. Care must be taken to ensure that the relay is correctly connected and labelled to indicate the installation it controls.

Where a multi-pole relay has been used and an addition is made in a block of flats or units, the connections of the wiring to each flat to the terminals from left to right shall be in the same order as shown on the meter label. e.g. if the relay is labelled "10/11/12", Flat 10 shall be connected to switch No. 1, Flat 11 to Switch No. 2 and Flat 12 to Switch No. 3. To facilitate the identification of cables and connections at the terminal block for multi-pole relays installed in multi-customer installations, numbered coloured colour markers (size 18/Z) shall be attached to the line and load conductors at each load control switch. The number and colour code shall be as shown in Table 3.

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TABLE 3

CONDUCTOR	CABLE MARKER		
LINE	RED PHASE	YELLOW PHASE	BLUE PHASE
Control Switch No. 1 No. 2 No. 3	Red 1 Red 2 Red 3	Yellow 1 Yellow 2 Yellow 3	Blue 1 Blue 2 Blue 3
LOAD			
Control Switch No. 1 No. 2 No. 3	White 1 White 2 White 3	White 1 White 2 White 3	White 1 White 2 White 3

NOTE: The motor circuit active and neutral conductors shall not be identified.

8. TEMPORARY OVER-RIDING OF RELAY CONTROL

Leaving the load switch of any of these relays in the "on" position cannot be relied upon to maintain supply for sufficient time to heat a storage water heater as the next command transmission may cause the switch to open. In exceptional circumstances, such as to avoid hardship or when an existing off-peak water heater is being replaced, the neutral conductor may be disconnected from the terminal of the relay and the load switch left in the "on" position to ensure an adequate initial heating period. The end of the cable shall be suitably insulated and a tag shall be attached to the seal on the terminal cover indicating "neutral conductor temporarily disconnected". Tag stock line number NG 1190 may be used for the purpose. Where the load switch is not in the "on" position, the cover may be removed and the switch manually placed in the "on" position provided there is no risk of rain, spray or mist entering. Where the existence of such weather conditions prevents the removal of the cover, the line and load conductors shall be clamped together at the load terminal to temporarily bridge out the relay.

When any action is taken to over-ride the relay control, the officer responsible shall inform the appropriate supervisor on the same day, using the I.126 Metering Request Form. The supervisor shall ensure that the normal connections are restored the next working day.

SECTION 7

AUXILIARY CONTROL RELAYS AND CONTACTORS

The Council provides three types of Auxiliary Control Relays (A.C.R.) for use in conjunction with time switches, D.C. Bias Relays or A.T.M. Rhythmatic Relays, for the control of supply which is not in excess of 30 amperes per phase, during specified hours. (See Service Rules).

Latching type, 50 to 100 ampere, 3 pole contactors are also provided for replacement, where required, of existing contactors of the same type which were installed when it was the Council's policy to provide contactors to control loads in excess of 30 amperes per phase.

The coil voltage and contact ratings are shown on the test cards attached to each of these relays or contactors.

All Auxiliary Control Relays are mounted in "S.D." type meter cases and for ease of identification the terminals, which are unmarked, are designated from left to right; 1 to 8 for the main or large terminals, and 9 to 11 for the small terminals.

A.C.R. TYPE III C (Figure 25)

This relay is an "Arrow" type, 3 pole, single throw, 10 ampere with a 240 volt "hold in" coil.

Connections

The connections are as shown in figure 25.

A.C.R. TYPE IIIC. SILENT (Figure 26)

This relay is a "Landis and Gyr" type, 3 pole, single throw, 30 ampere with a 240 volt contactor closing motor.

Connections

The connections are as shown in figure 26.

A.C.R. TYPE IV.C. (Figure 27)

This relay is a "Security" or similar type, 4 pole, single throw, 30 ampere with a 240 volt "hold in" coil.

Connections

The connections are as shown in figure 27.

A.C.R. TYPE VII (Figure 28)

This relay is an "Arrow" type, 3 pole, double throw, 10 ampere with a 240 volt "hold in" coil.

Connections.

The connections are as shown in figure 28.

One pole of this relay shall be used to control a "latching" type contactor when provided by the customer as shown in figure 31.

LATCHING TYPE CONTACTORS (Figures 29, 30 and 31)

These contactors are either the "Godfrey" or "O.J.N." type, 3 pole, single throw, 50 or 100 amperes with 240 volt latching coils.

Connections

The connections are as shown in figures 30 and 31.

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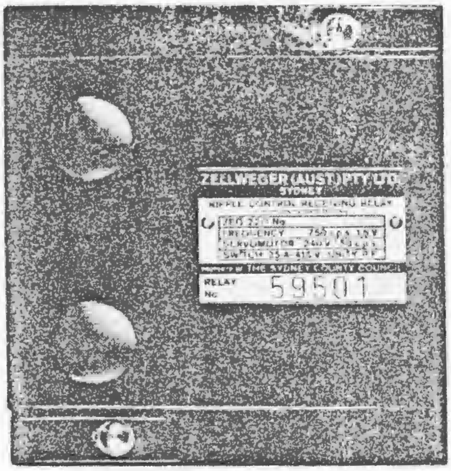
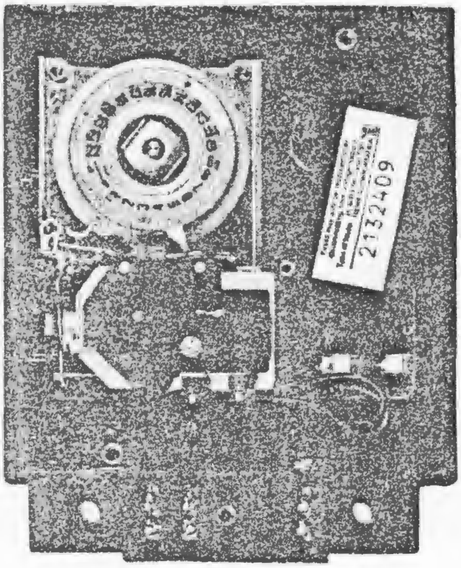
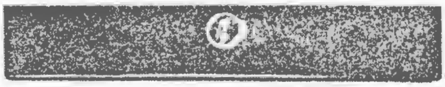






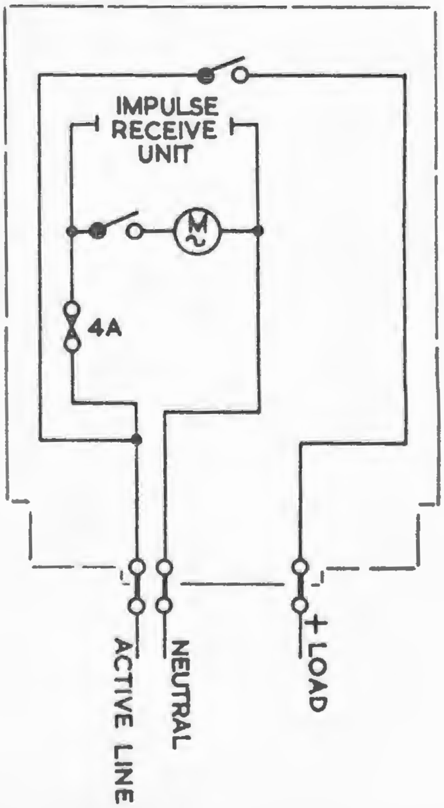
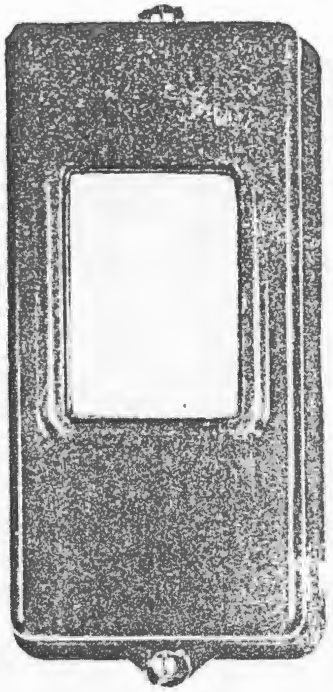
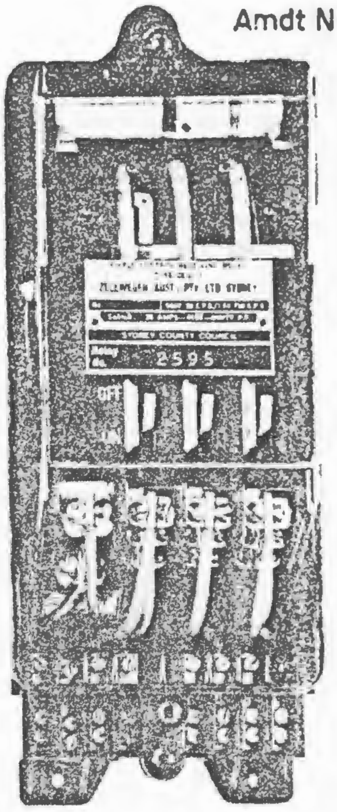


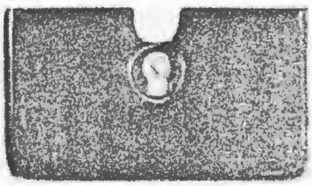
FIGURE 23

ZELLWEGER

TYPE ZEQ 22/1
FREQUENCY INJECTION
C.L.C. RECEIVING RELAY







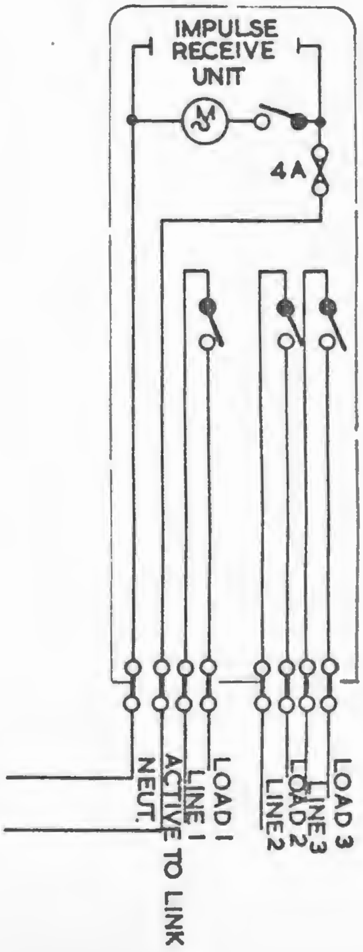
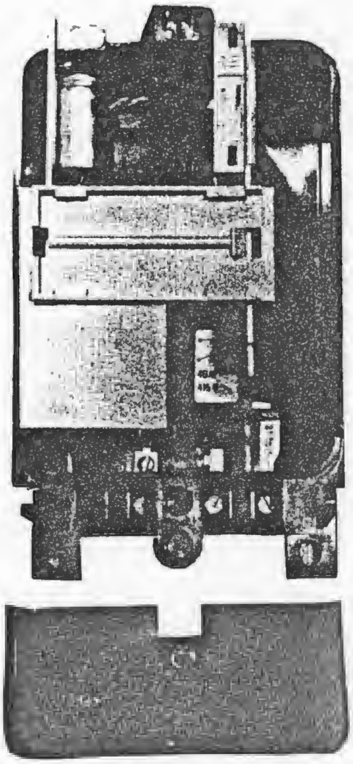


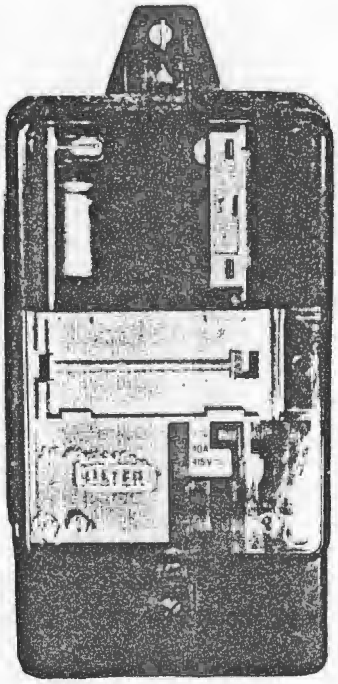
FIGURE 24

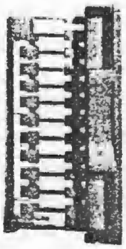
ZELLWEGER

TYPE ZE 22/3
FREQUENCY INJECTION
C.L.C. RECEIVING RELAY



COVERS REMOVED



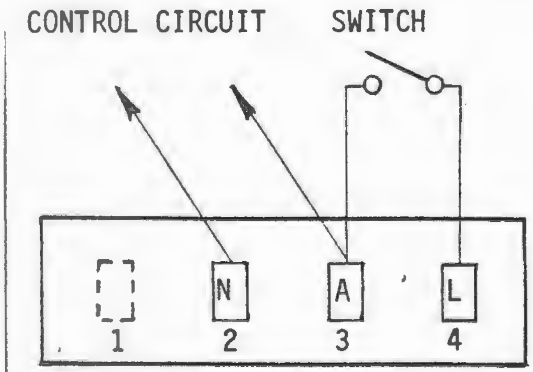


CODE CARD

FIGURE 24A

ZELLWEGER

TYPE RE1 (DECABIT)
FREQUENCY INJECTION
C.L.C. RECEIVING RELAY



Terminal	Connection
1	Not Used.
2 (N)	Neutral.
3 (A)	Active or line.
4 (L)	Load.

CONNECTION DIAGRAM

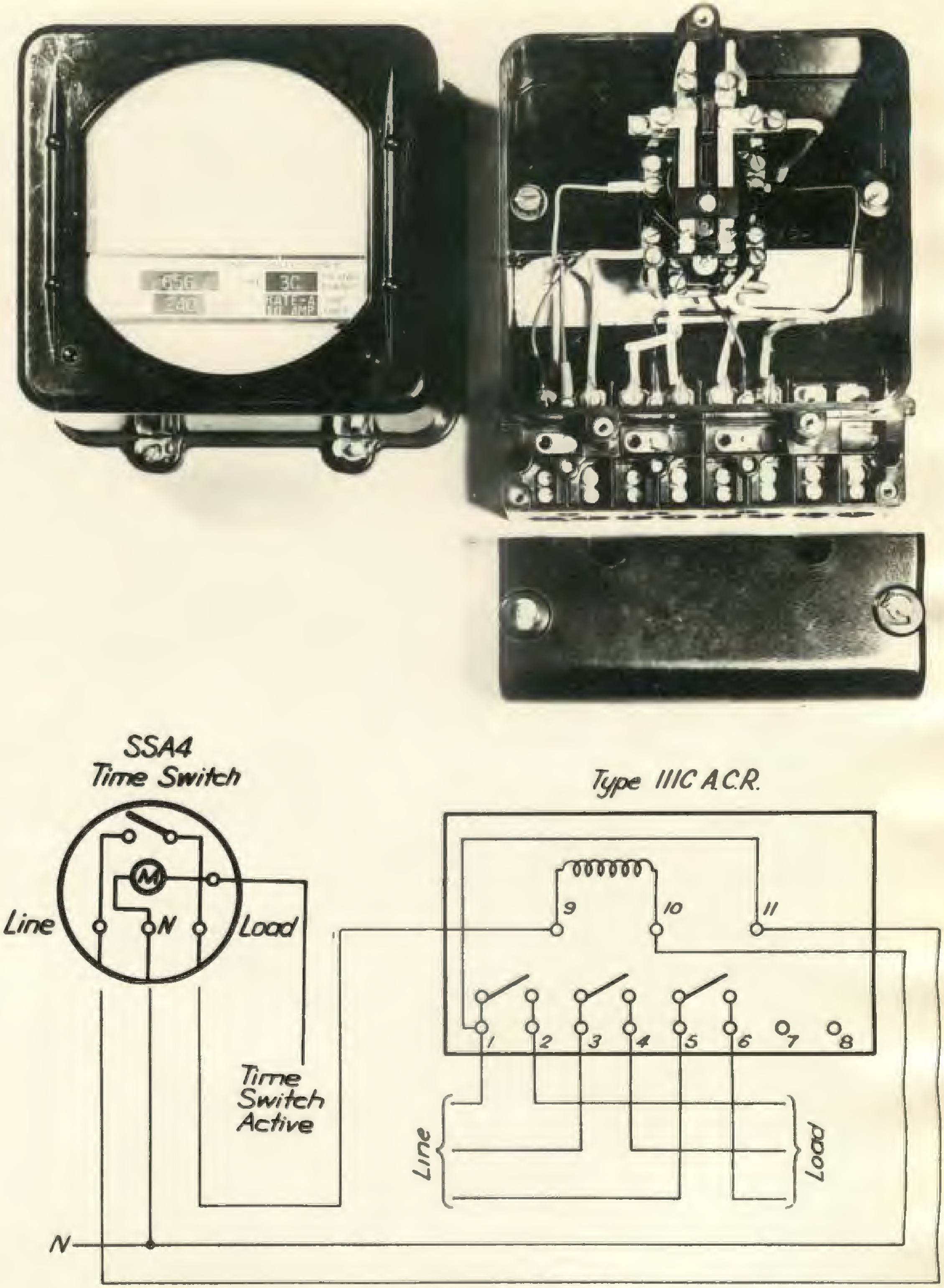


FIGURE 25

AUXILIARY CONTROL RELAY TYPE IIIC AND CONNECTIONS

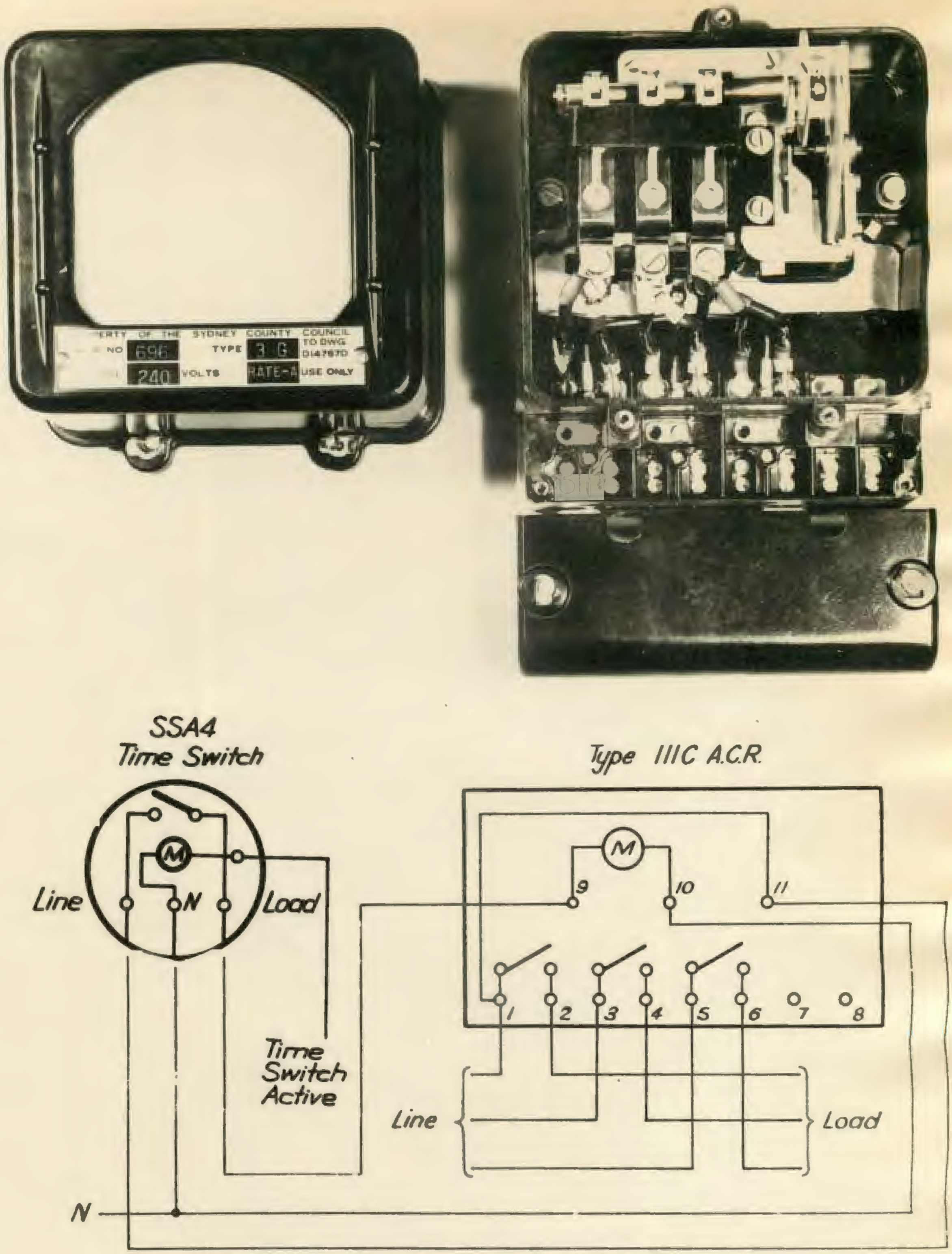


FIGURE 26

AUXILIARY CONTROL RELAY TYPE IIIC (LANDIS AND GYR, SILENT) AND CONNECTIONS

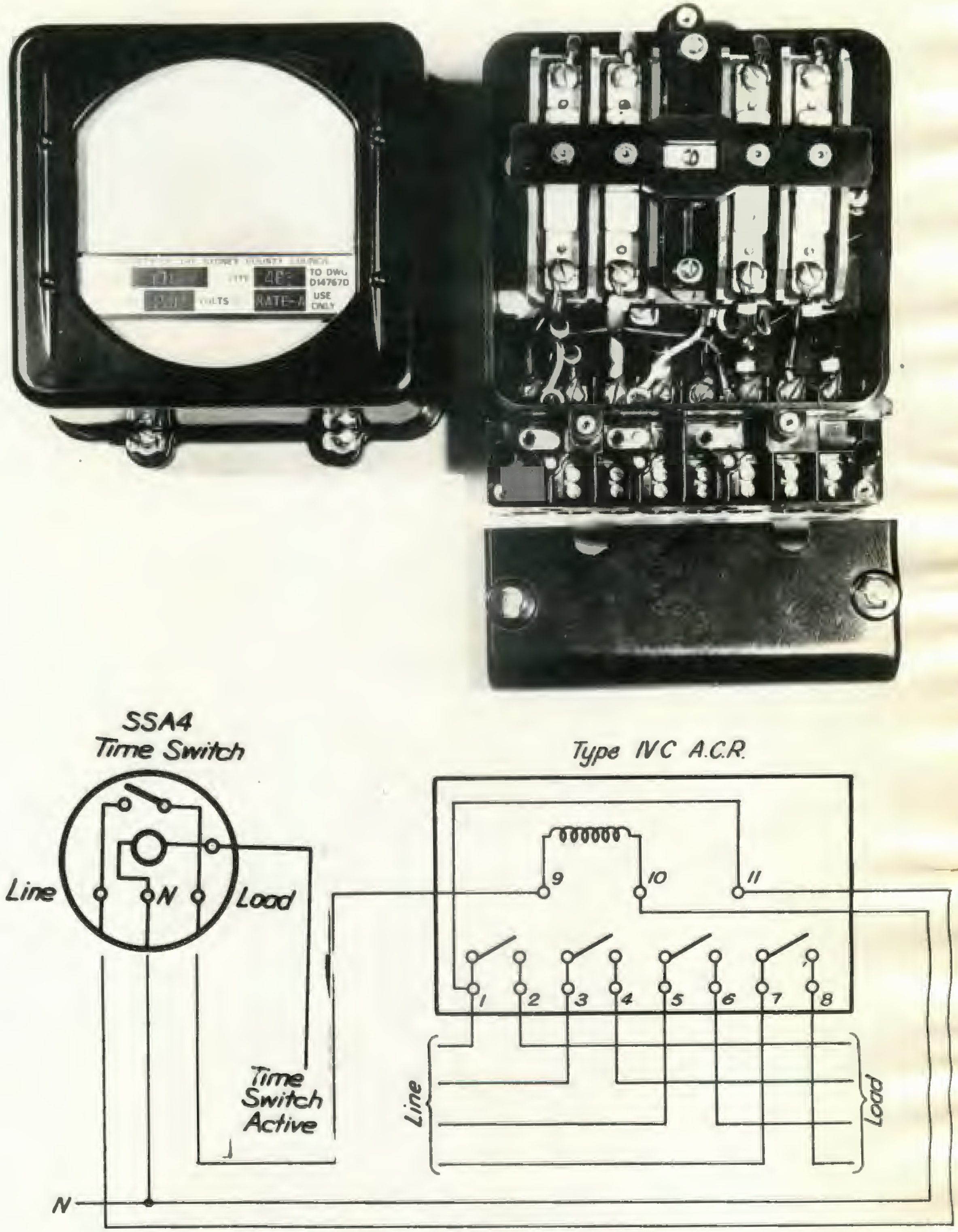
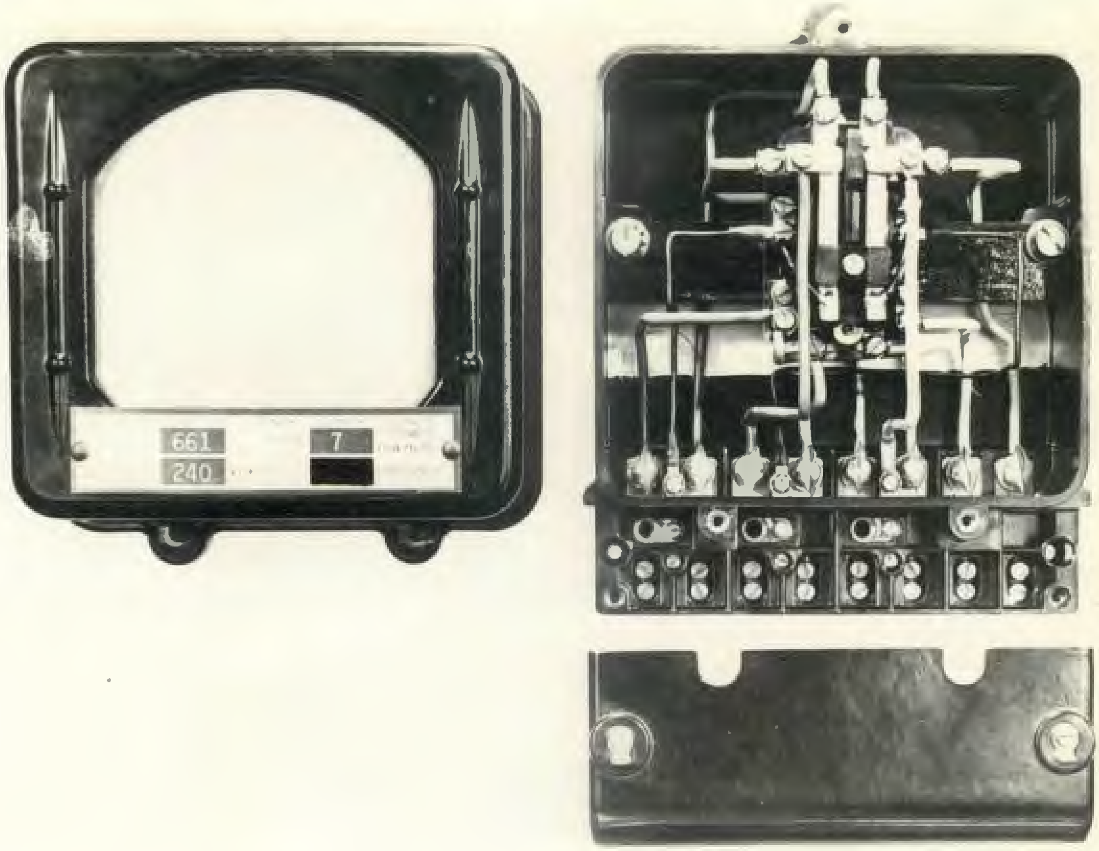


FIGURE 27

AUXILIARY CONTROL RELAY TYPE IV C AND CONNECTIONS



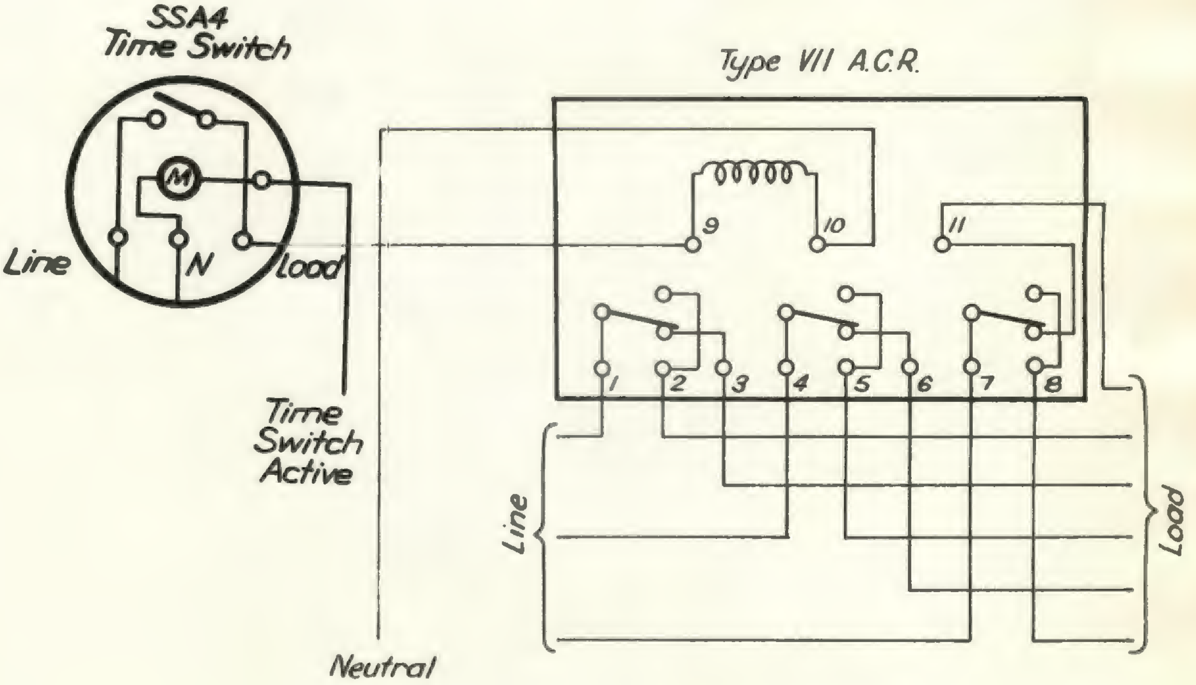


FIGURE 28

AUXILIARY CONTROL RELAY TYPE VII AND CONNECTIONS

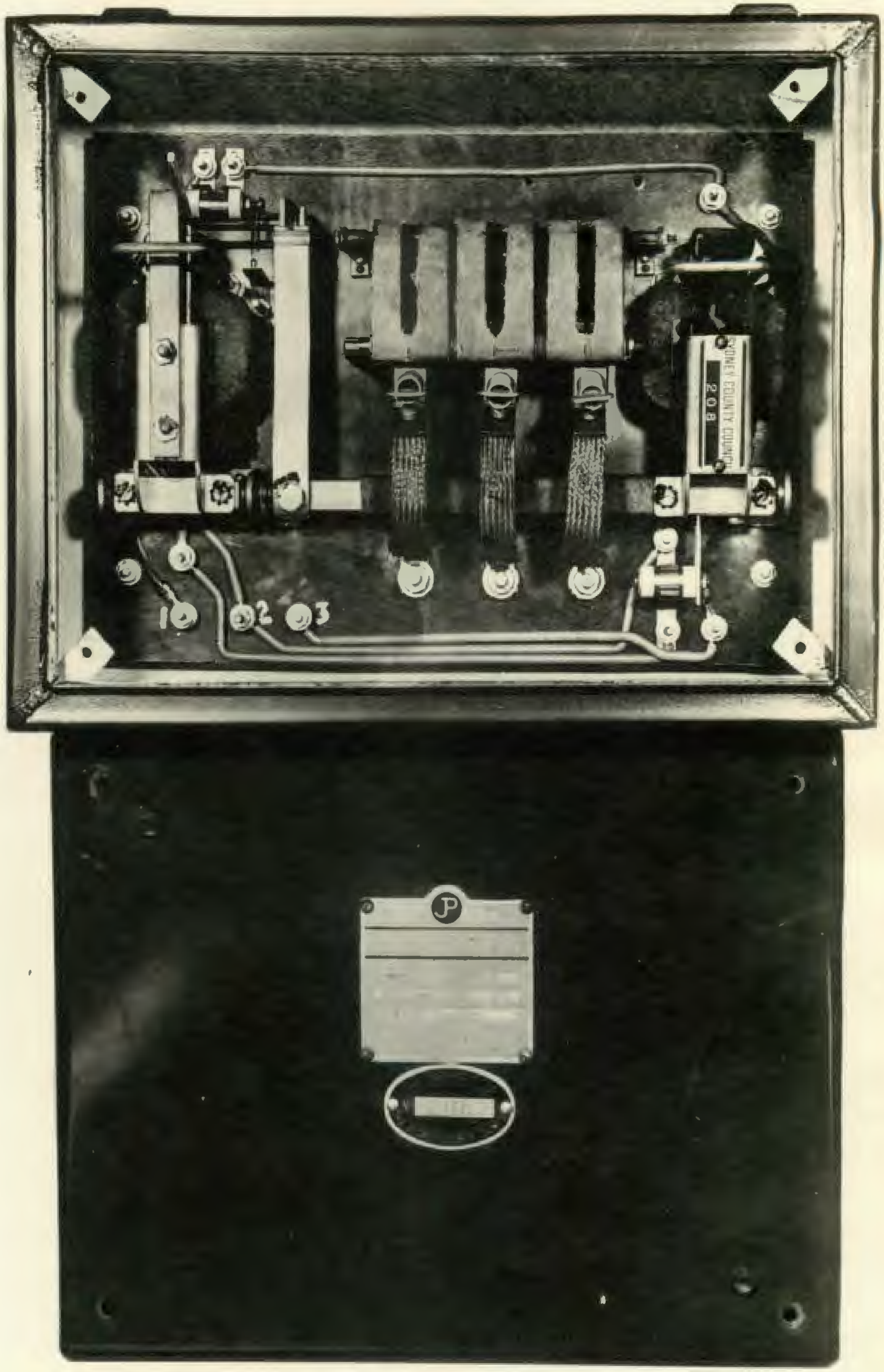


FIGURE 29

LATCHING TYPE CONTACTOR

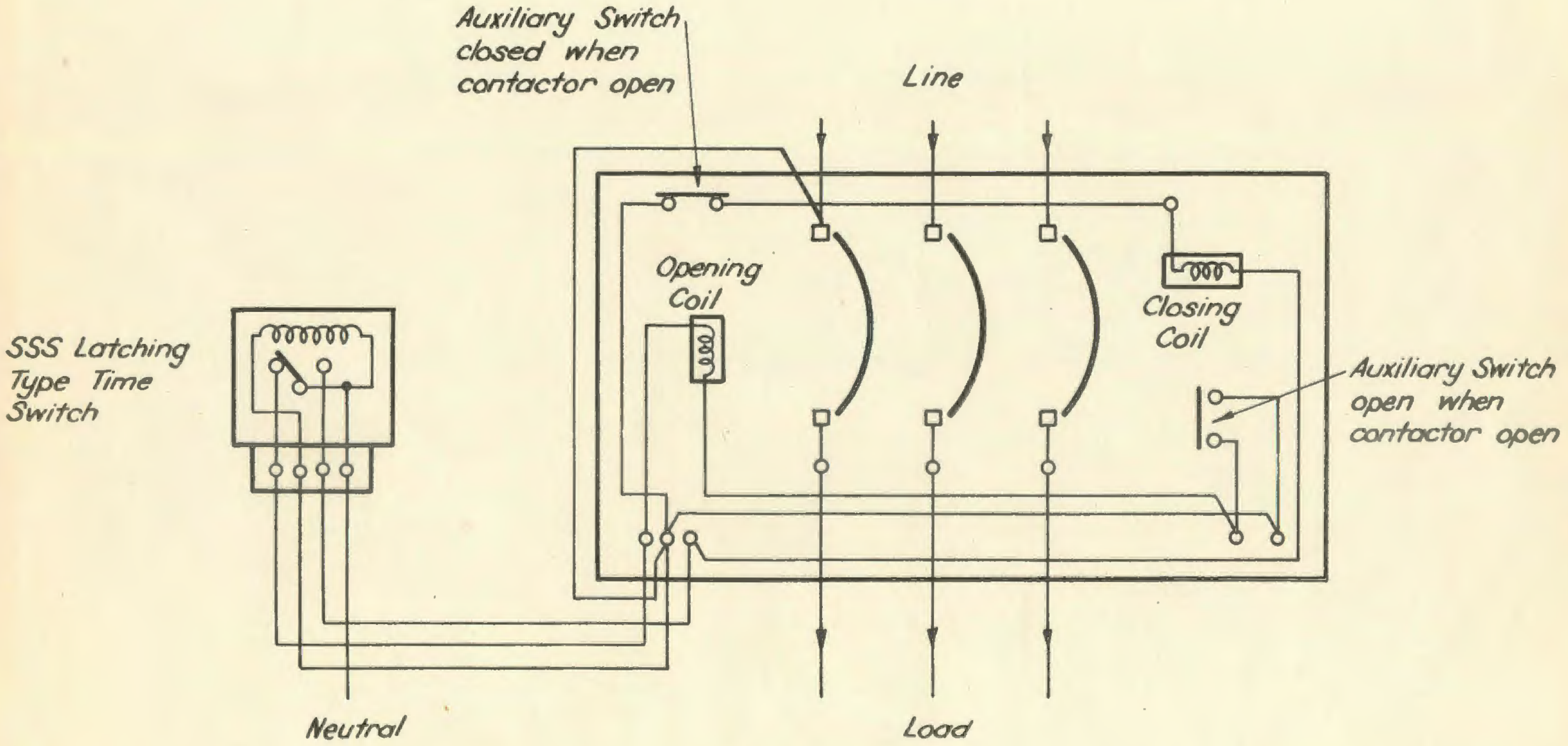

Auxiliary Switch closed when contactor open
Line
Opening Coil
Closing Coil
SSS Latching Type Time Switch
Auxiliary Switch open when contactor open
Neutral
Load

FIGURE 30

GODFREY LATCHING TYPE 3 PHASE CONTACTOR CONTROLLED BY A SSS TYPE TIME SWITCH.

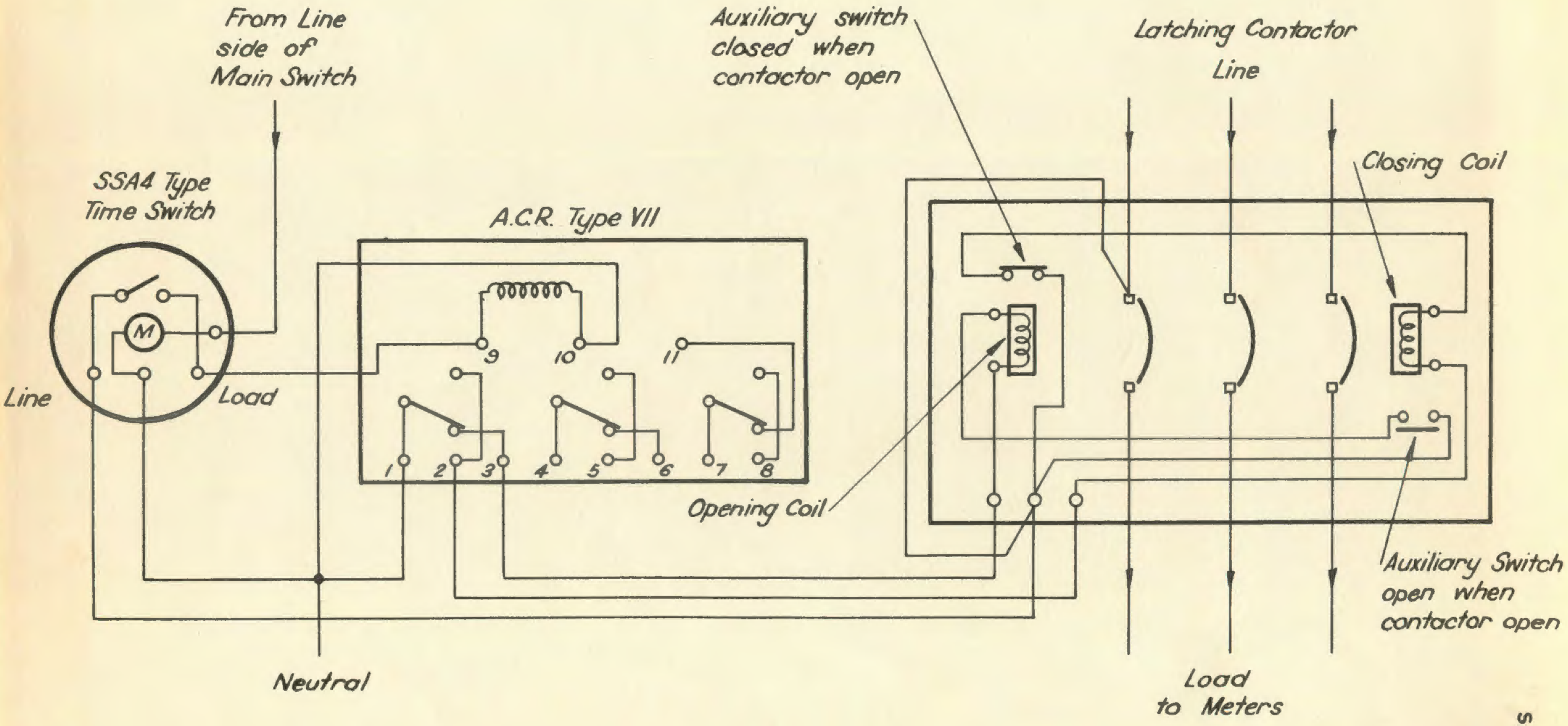


FIGURE 31

TYPICAL LATCHING TYPE CONTACTOR CONTROLLED BY AN A.C.R. TYPE VII
AND A SSA4 TYPE TIME SWITCH

SECTION 8

GENERAL METERING INSTRUCTIONS

Connection & Disconnection of Mains Meters and Installations

General Page 1
Direct & E.L.C.B. Earthing Systems Page 1
M.E.N. Earthing System Page 1
Connection and Disconnection of,

1. Neutral Conductor Page 2
2. Meters Page 2
3. Links Page 3

Parallelling of Consumer's Mains Page 4

Method of Metering Energy and Demand Page 6

Authority for the Connection of Supply after Metering Page 8

Working on Live Conductors

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Binding of Cable Ends Page 13

Leaving Job Tidy Page 14

CONNECTION AND DISCONNECTION OF MAINS, METERS AND INSTALLATIONS

All work must be carried out in accordance with this Section 8, and with Section 10, "Whole Current Metering" where the sustained load current is less than 80 amps. per phase or with Section 11, "C.T. Metering" where the sustained load current exceeds 80 amps. per phase.

General

To obviate the risk of fire, shock and other dangers when carrying out any work at switchboards, meters, links, service fuses, points of attachment or service lines, care must be taken to ensure that all connections are correctly made, particular attention being given to the neutral connections.

Direct and E.L.C.B. Earthing Systems

In those areas where the customers' installations are earthed by the "direct earthing system" or where the "earth leakage circuit breaker systems" are used, the transposition of phase and neutral connections or open circuited neutrals are likely to cause fires or severe damage to the customers' installations and/or apparatus.

M.E.N. Earthing System

In those areas where the "multiple earthed neutral (M.E.N.) system" of earthing is used, (viz. Sutherland Shire, Bankstown Municipality, parts of Hornsby Shire and parts of Eastwood in the Ryde Municipality) such errors, in addition to causing damage, could produce conditions in customers' premises which could result in persons receiving serious shocks from apparatus or portions of the installations which are normally "dead".

The earthing system of each customer's installation is connected directly to the Council's neutral. The earthing conductor of the installation is also connected to the water pipe or an electrode at the customer's premises, but it cannot be assumed that this will provide protection against wrong connections of the phases and neutral supply conductors. Basically, the customer is depending for the earthing of his installation, on the provision of a sound and unbroken neutral conductor, which is maintained at approximately earth potential, from his installation through the Council's neutral distributors to the transformer neutral connection at the Substation. If therefore, the neutral is broken anywhere between these two points (i.e. the customer's neutral link and the Substation neutral point), not only may the customer be left without any effective earthing of his installation, but his installation earthing system may be energised up to full voltage through any appliances that may be switched on at the time. In the same way, if the phase and neutral conductors are transposed in the distributors, service connections or meter wiring, full voltage may be applied to the customer's earthing system including appliance frames. This is so, even in installations supplied from a single phase, two wire service.

Connection and Disconnection of,

1. Neutral Conductor

In connecting customers' installations, or in making connections on the low voltage distribution system, the neutral conductor must be positively identified before the connection is made. The neutral conductor, so identified, must be connected to the neutral distributor, neutral service main or neutral service link as appropriate, and with test lamps, ensure that it is at approximately earth potential. If necessary, run a length of sealing wire to a known earth, such as a water pipe, for this test. This applies to both single and multi-phase installations.

If for any reason in an M.E.N. installation, the neutral conductor cannot be positively identified at the time, no connection whatsoever shall be made until such identification is made.

IN CONNECTING MAINS OR INSTALLATIONS, THE NEUTRAL CONNECTIONS MUST BE MADE FIRST, AND WHEN DISCONNECTING, THE NEUTRAL CONNECTION MUST BE BROKEN LAST.

Care must be taken that all neutral connections are firmly connected in such a manner that they will not break or become loose under any conditions that may be expected in service.

2. Meters

Every Connecting Officer is responsible for ensuring that all instruments installed or worked upon by him are correctly wired and connected and the checks and tests laid down in Section 10 and 11 shall be made to verify this. It is particularly important in the case of polyphase meters that errors such as incorrect phase sequence and reversed line and load connections to any element do not occur as these may pass unnoticed for some time and the Council may thereby lose considerable revenue.

It may be found that metering conductors have been passed through the holes in the meter board, or identified with marks or labels by the electrician. These may be used as a guide only, they must never be relied upon as being correct. The Connecting Officer must satisfy himself that he is making the correct connections by visual tracing or by checking with test lamps, continuity tester etc.

When connecting new conductors to an existing meter, altering an existing installation in any way, or when replacing an existing meter, care must be taken to ensure that all connections at the customer's switchboard are left as found. Before commencing work, a check must be made that the main switch is connected in the active conductor or conductors and, if it is found to be incorrect, it must be left in the same manner and a supervisor notified. See also Section 9, "Phase Sequence and Phase Relationship".

When a meter is removed from an installation and it is likely that meters will be needed at this position in the future, all of the active metering conductors shall be disconnected at the point of supply, adequately insulated and left in a neat manner clear of all live metal. All of the conductors at the meter board shall be turned back upon themselves and insulated. The loop thus formed must be entered in the meter board hole and left in a neat manner. Suitable labelling must be made on the conductors for future identification. Any disused meter connector blocks shall be removed and returned for further use.

If it is impracticable to keep the disused metering conductors clear of live metal at the point of supply, they must be completely removed.

Note: When removing CT meters, the CT secondary circuit must be bridged. See Sections 6 and 11.

3. Links

All connecting and parallelling links (See Section 1, "Metering Accessories") must comply with the Service Rules, incorporating the "Links Document".

Care must be taken that 415 volts is not applied to room blocks or any other arrangement of links designed for only 240 volts. This particularly applies to existing old type links where studs are used as links. Test lamps must be used before carrying out any work to ensure that adjacent studs or links are connected to the same phase.

When removing meters connected to links, the meter line conductors may remain in position only if they are adequately insulated adjacent to the links and kept clear of live metal by turning the end back through the link panel or by other means.

All unmetered links must be sealed and labelled by Council's Officers in accordance with Section 13, "Sealing and Labelling".

PARALLELLING OF CONSUMER'S MAINS

It frequently occurs that due to alterations in an existing installation, a two or three wire service only is required where four wires are connected.

Connecting Officers will be required at times, to reduce the 50 amp. service in simple domestic installations to either two or three wires as required.

The methods to be used in reducing services are as follows:-

1. Withdraw all service fuses.

2. Where one service line is to be removed, the Connecting Officer shall disconnect the consumer's mains cable from the active service line furthest from the mains box or bell mouth and from the corresponding service fuse. This cable shall then be connected in parallel with the neutral cable of the consumer's mains. The load conductor shall be disconnected from the meter from which the load has been removed and, unless the electrician has arranged the switchboard wiring so that this conductor can be removed, it shall be connected in parallel with the load conductor from one of the remaining meters.

3. Where two service lines are to be removed, the Connecting Officer shall disconnect the consumer's mains cables from the active service lines furthest from the mains box or bell mouth and from the corresponding services fuses.

   One of these cables shall then be connected in parallel with the neutral cable, and the other with the remaining active cable of the consumer's mains.

   The load conductors shall be disconnected from the two meters from which the load has been removed and, unless the electrician has arranged the switchboard wiring so that these conductors can be removed, they shall be connected in parallel with the load conductor from the remaining meter.

4. The disconnected meters and service fuses shall be removed and a memo requesting the removal of the disused service lines shall be addressed to the P.C./R.C./M.S.O. and returned with the day's run.

5. If for some reason the Connecting Officer cannot disconnect the disused consumers mains from the service lines, he shall disconnect the cables from the service fuses, tape the ends and remove the service fuses. In the memo to the M.S.O. above, a request shall also be made for the Mains Branch to parallel these conductors at the point of attachment and at the service fuse and/or neutral link.

Two or three strands may be cut from each cable if necessary for their connection into the mains box or service fuse terminals.

A neutral connector box shall be mounted on the meter board and used as an active load link where it is necessary to connect meter load conductors in parallel.

Where a bell mouth cable entry is used and the consumer's mains are connected direct to the service lines, the parallel connections shall be made in a line connector. It may be found that the existing connector may have deteriorated, in which case it must be replaced.

Where a mains connector box is used, the parallel connections shall be made by either of the following methods according to the circumstances of the job:-

(a) The consumer's mains cables shall be parallelled in the one mains box terminal and the loop from the service line removed.

(b) The consumer's mains cables shall remain connected to their respective mains box terminals and the loops from the service lines shall be connected in parallel on the service line with a line connector.

(c) The consumer's mains cables shall remain connected to their respective mains box terminals and the loops from the service lines removed. A short piece of cable (7/.036 will be satisfactory) shall be used to parallel the cables by bridging between the appropriate mains box terminals.

METHOD OF METERING ENERGY AND DEMAND

1. ENERGY

The energy supplied by one or more phases of any polyphase system may be measured by separate single phase meters or a combination of single phase elements within one instrument, such as in a polyphase meter. See Section 4, "Alternating Current Meters".

Where the sustained load current of an installation is less than 80 amperes per phase, whole current meters will be installed in accordance with Section 10. When the sustained load current is greater than 80 amperes per phase, current transformer metering will be installed in accordance with Section 11.

(a) Metering a 240 Volt, Single Phase, 2 Wire Supply

A 240 volt, single phase, 2 wire supply can be made available by utilising one phase and a neutral of a three phase, 4 wire distribution system.

The energy in a 240 volt single phase supply may be measured by a single phase kilowatthour meter, the current coil of which is connected in series with the phase and its voltage or potential coil connected between the phase and neutral.

(b) Metering a Two Phase, 3 Wire, Low Voltage Supply

A two phase 3 wire service can be made available by utilising two phases and a neutral of a three phase, 4 wire distribution system.

The energy in a two phase 3 wire supply may be measured by two single phase kilowatt-hour meters or by a 2 element 3 wire polyphase meter. In each instance the voltage or potential coils of the kilowatt-hour meter would be connected between each phase and neutral.

(c) Metering of a Three Phase, 4 Wire, Low Voltage Supply

The energy in a three phase 4 wire circuit is the sum of the energy in each phase to neutral circuit and can be measured even under unbalanced conditions by three single phase kilowatt-hour meters, the current coils of which are connected in series with the individual phases and the voltage or potential coils connected between the corresponding phases and the common neutral. Alternatively, a three phase, 3 element 4 wire polyphase kilowatt-hour meter can be used to measure the energy in a three phase 4 wire circuit under any loading conditions.

The energy in a balanced three phase, 4 wire circuit can also be measured by one single phase meter, the total power would then be obtained by multiplying the reading by three (k3). This is not however considered satisfactory as in actual practice it is very rarely that the load on the three phases is balanced in all respects, and this method is therefore not now used by the Council. Sometimes however, one single phase kilowatt-hour meter may be installed as a sub-meter in a balanced three phase motor circuit where there is no likelihood of the load being unbalanced under normal conditions. See explanation of reading constants in Section 2, "Meter Reading".

Where welders, X-ray equipment etc., form part of a polyphase load, the use of single phase meters has the disadvantage that the reversal of one or more of the meters may occur and, where this reversal is sufficient to cause a minus registration in any meter over a complete reading period, it is preferable that such loads be metered by a polyphase meter. However, this can only be determined after the load has been connected for a period and would have been reported. See B.S.I. No. 374, index 442.

It was formerly the practice, where a two phase 415 volt supply was made available, to use a meter known as a single phase 415 volt meter, the potential coil being suitable for the line voltage. To prevent illegal diversion of energy with this type of meter, the current coil was split in two, each half being connected in series with each phase. It is the practice now however, in new 415 volt installations to run a neutral conductor for metering purposes, a polyphase 3 wire meter being used.

2. DEMAND

The demand in amperes (or kW when at unity power factor) of an installation may be determined by connecting a Maximum Demand Indicator in series with the load conductor from each single phase meter or from each element of a polyphase meter.

AUTHORITY FOR THE CONNECTION OF SUPPLY AFTER METERING

New installations must not be connected without the authority of an Installation Inspector.

The metering request form (C.I.I. 126) will state either,

(a) "Get Ready for I.I." - meaning the R.F.T. has been received and the metering shall be completed but not connected as the inspection has not been carried out.

(b) "Connect" - meaning the installation has been inspected and may now be connected.

(c) "Not R.F.T." - meaning the R.F.T. has not been received and the installation must not be connected.

It often happens that an inspection has been made of an installation just prior to the Connecting Officer's visit, and in such cases the Installation Inspector will have left in a service fuse box, under a link cover or attached to a cable, a further C.I.I. 126 form stating that the installation may or may not be connected. The instruction on this more recent form shall take precedence over any others.

Installations must be left ready for connection by the following methods:-

(a) In all "new service" installations, other than simple domestic, the service fuses shall be "sealed out", and in addition where large multi-customer metering is involved (home units, blocks of offices etc.) the meter load conductors shall also be sealed out.

Before energising links to which individual customers are to be connected, care must be taken to remove all conductors which are not in use or connected to the line side of a meter

(b) In all single domestic installations, (either a new service or additions to an existing service) the service fuses and meter load conductors shall be left connected provided either of the following is carried out.

(i) If the main switch is an overload circuit breaker, the breaker shall be left in the "OFF" position and a C.I.I.47 label attached to the operating knob or handle in such a manner that the breaker cannot be closed without detaching or removing the label. Where this is not possible, the label shall be attached in such a manner that the breaker cannot be closed without the label being noticed.

(ii) If the main switch is not an overload circuit breaker, it must be left in the "OFF" position and all fuses controlling outgoing circuits from the main switch board shall be removed from the fuse bases and tied to the switchboard with a label C.I.I. 44 attached.

(c) In all cases where additional customers or rates are connected to an existing service, other than single domestic, the meter load conductors shall be sealed out. If, due to the cable size or reducing lugs, this is impracticable, the load conductors must be left connected and either of the above clauses (b) (i), or (b) (ii) complied with.

When carrying out metering work on any existing installation, the supply may be reconnected to maintain supply to the existing load providing however there has been no major alterations to switchboards, mains etc. (the alteration of position of a residence switchboard is not considered major). It can be taken as a general rule that if a metering request form has been issued for the job, arrangements have been made for an inspection to follow the metering and in the absence of anything to the contrary, it may be taken as the authority to reconnect an existing installation.

NOTE: To "Seal out" the service fuses, the fuses must be withdrawn and tied to the side of the fuse box or cabinet with sealing wire and sealed in the usual manner. To "Seal out" the meter load conductors, the conductor must be removed from the load terminal of the meter, the bare end then being returned into the hole in the meter board under the sealed terminal cover in such a manner that it may be easily retrieved when necessary. This applies to meters with or without meter connector blocks.

WORKING ON LIVE CONDUCTORS

General

At some stage in the process of metering and connecting an installation, live conductors must be worked upon, either when replacing the service fuse or connecting at links or meters.

Care must always be exercised whilst carrying out this work so that simultaneous contact is not made between two live conductors or between a live conductor and earth. Safety protective devices must be used where necessary. If the operation cannot be done with safety, the customer shall be approached with a view to interrupting supply whilst the connections are made. If suitable arrangements cannot be made, the fact shall be reported to the Officer's supervisor.

Polyphase Meters

As there is very little clearance between the terminals of opposite phases in a polyphase meter, and consequently, unless meter connector blocks are installed, no attempt shall be made to connect or disconnect a polyphase meter whilst it is energised.

When a meter connector block has been short circuited for maintenance of supply during the replacement of a polyphase meter, all "pigtails" must be removed from the meter connector block prior to removing the meter as the otherwise exposed ends would be alive. Similarly, the "pigtails" must not be replaced until after the new meter is in position.

Single Phase Meters

When changing single phase meters whilst energised, care must be taken to prevent accidental contact between the active and neutral conductors. Therefore, before removing any line or load conductor, "pigtail", or reducing lug from the meter, the neutral conductor must be removed and turned back through the hole in the meter board, or if this is not practicable, it must be taped.

The neutral conductor must not be reconnected until the new meter is in position and the line and load conductors, "pigtails" or reducing lugs have been reconnected.

MINERAL INSULATED METAL SHEATHED (M.I.M.S.) AND ALUMINIUM CONDUCTORS

Mineral Insulated Metal sheathed cables must not under any circumstances be connected to the terminal of any Council equipment. This type of cable is designed to carry maximum current at very high temperatures which would be quickly transmitted to the meter, service fuse, transformer etc. It also has the added disadvantage of being difficult to handle in confined quarters without special tools.

Similarly, due to the corrosion that may be set up in joints between aluminium and copper and other dissimilar metals, aluminium conductors must not be connected to the terminal of any Council equipment.

When installed in installations, cables of these types may be terminated in a link or other suitable device, and a stranded cable connected between the link and the Council terminal (or busbar may be used in the case of C.T's. service cabinets, etc.)

See also Section 6 re the earthing of the sheaths of M.I.M.S. cables when used with ring or tunnel type C.T's.

PROVISION OF CABLE BY THE COUNCIL

All metering conductors will be provided by the Customer in accordance with the Service Rules, except that the Council will provide the following:-

(a) The conductor to the synchronous motor terminal of a four terminal time switch.

(b) The cable for reconnection of existing installations where the customer has not had to engage an electrician to carry out work relative to the reconnection.

(c) The 19/.044 cable where required for connection to polyphase meters as explained in Section 10, "Whole Current Metering".

(d) The 7/.036 "pigtail" between the meter connector block and the meter terminals.

(e) Where the Domestic Standard Service Board replaced an older type board due to deterioration or because of an increase in the size of the board due to additions, the Council will provide cable to lengthen the EXISTING cables if required.

(f) The RED, YELLOW and BLUE cables between the test block and meter terminals and BLACK cable between the neutral connector box and the meter and test block neutral terminals in C.T. metering.

(g) In any other case where in the opinion of the Foreman or the Supervisor Metering, the provision of cable is deemed necessary.

BINDING OF CABLE ENDS

In all tunnel type terminals, where the tunnel size permits, the bared conductor shall be bound with a layer of sealing wire to prevent the spreading of the strands. Several layers may be required if the conductor is a great deal smaller than the terminal so that the clamping screw makes adequate contact. If there is insufficient room to accommodate a bound conductor, the strands shall be twisted tightly together with pliers prior to connection. Similarly, any conductors connected in parallel to a tunnel type terminal shall be bound together where space permits. However, where it is necessary to connect a conductor of small cross sectional area with one of a much larger size, (e.g. 7/.036 to 19/.064) the strands of the smaller conductor shall be spread and clamped under the larger conductor in the tunnel type terminal.

LEAVING JOB TIDY

All premises must be left in a tidy condition. Cable scraps and wood shavings shall be placed in the customer's garbage receptacle or left in a neat heap. Under no circumstances must any of the customer's cable or equipment be removed from the premises.

(Amdt. No. 17, 13.11.67)

METERING INSTRUCTION BOOK - SECTION 9
Superseding existing Contents page.

SECTION 9

PHASE SEQUENCE & PHASE RELATIONSHIP

Description of Phase Sequence Indicator	Page 1
Checking of Phase Sequence Indicator	Page 1
Use of Phase Sequence Indicator	Page 1
Checking Phase Sequence of Customers' Installations	Page 2
Phase Relationship	Page 3

SCS Sutherland

METERING INSTRUCTION BOOK - SECTION 9
Superseding Page dated 13.11.67.

PHASE SEQUENCE

Description of Phase Sequence Indicator

The miniature phase sequence indicator is designed for 415 volt operation and employs two miniature neon tubes, miniature resistors and a small capacitor. All components are moulded in a transparent epoxy resin case which makes the device waterproof and mechanically robust.

The neon tubes are marked "clockwise" and "anticlock" respectively, the glowing tube signifying the appropriate phase sequence. The other tube remains extinguished.

Red, yellow and blue test leads emerge from one end of the case through protective bushes and are fitted with jack plugs having insulated grips.

A tapered prod and an alligator clip are provided for use as required to secure the red lead ("A") to the equipment being tested whilst the yellow and blue leads ("B" & "C") are held as test prods.

The tapered prod is designed to be wedged between the two terminal screw heads and the terminal block on polyphase meters and the alligator clip is for use on service fuses, links and similar equipment.

Checking Indicator.

To ensure the phase sequence indicator is in order and to prevent false indications, the red and blue leads must always be connected first. A change will then take place in the indicator tubes when the yellow lead is connected, proving the indicator correct.

e.g. When the red and blue leads are connected to the left and right hand line terminals respectively of a 3 phase meter, both tubes will glow. When the yellow lead is connected to the middle line terminal, one tube will be extinguished leaving the other tube glowing to denote the phase sequence.

When the red and blue leads are connected to the left hand line terminal and neutral terminal respectively of a 2 phase meter, neither of the tubes will glow. When the yellow lead is connected to the right hand line terminal, either both tubes or one tube only will glow.

Use of Indicator.

All polyphase meters are tested and adjusted for an anticlockwise phase sequence and they must be connected accordingly. If connected clockwise the meters will record inaccurately.

The methods to be used in checking the phase sequence of meters are as follows:-

1. THREE PHASE DIRECT CONNECTED METER

The tapered prod shall be fitted to the red lead ("A") and connected to the left hand line terminal. The blue lead ("C") shall be connected to the right hand line terminal and the yellow lead ("B") to the middle line terminal.

If the phase sequence is correct the tube marked "anticlock" will glow. If however the "clockwise" tube glows the sequence is incorrect. The two outer line conductors to the meter shall then be interchanged at the rear of the meter board and a further check made. The position of the indicator leads, red, yellow, blue from left to right must not be changed.

2. TWO PHASE DIRECT CONNECTED METER

The tapered prod shall be fitted to the red lead ("A") and connected to the left hand line terminal. The blue lead ("C") shall be connected to neutral terminal and the yellow lead ("B") to the right hand line terminal.

If the phase sequence is correct the tube marked "clockwise" will glow. If however the "anticlock" tube glows or if both tubes glow, the sequence is incorrect. The two line conductors to the meter shall then be interchanged at the rear of the meter board and a further check made. The position of the indicator leads, red, yellow, blue from left to right must not be changed.

3. C.T. CONNECTED METERS

The method of checking the phase sequence of C.T. connected meters is the same as detailed above for Direct Connected metering except that the indicator prods shall be connected to the potential terminals.

NOTE: For correct anticlockwise phase sequence of the meter with the indicator leads connected red, yellow, blue left to right, the "anticlock" tube will glow on a 3 phase meter and the "clockwise" tube will glow on a 2 phase meter.

Customers' Installations

When carrying out metering work on existing installations, care must be taken so that it is reconnected with the same phase sequence.

Before commencing work, the direction of rotation of a three phase motor shall be observed, the direction being noted by an arrow mark on the pulley or other convenient place. In selecting a motor for this check, care must be exercised to ensure that in the event of the direction being reversed on reconnection, no damage will result. In the case of a belt drive, remove the belt if possible.

METERING INSTRUC[illegible]ON BOOK - SECTION 9
Superseding Page 2, dated 13.11.67.

When the direction of rotation is incorrect, the phase sequence must of course be reversed and the motor checked again.

If there is no suitable motor for this check, the phase sequence shall be checked by means of the Phase Sequence Indicator at the customer's main switch, links, etc. Care must be taken that the Phase Sequence Indicator is connected in the same manner and to the same terminals before disconnection and after reconnection. When the first check of phase sequence is made, i.e. before disconnection, make a record whether the "clockwise" or "anticlockwise" tube glows with the leads connected red, yellow, blue from left to right.

Phase Relationship

Customers' installations shall be connected and checked in accordance with Section 8, "General Metering Instructions", Section 10, "Whole Current Metering" and Section 11, "Current Transformer Metering".

Particular care must be taken to ensure that existing installations are reconnected with the same phase relationship. Therefore, before commencing work, checks shall be made that the main switch is connected in the active conductor or conductors, an if incorrect it must be left the same way and the supervisor notified.

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SECTION 10

WHOLE CURRENT METERING

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CONNECTION OF DIRECT CONNECTED METERING

When an installation has a load current of less than 80 amperes per phase, Direct Connected Metering shall be installed in accordance with this Section 10, with Section 8, "General Metering Instructions" and with the Section relating to a particular rate where applicable.

When an installation has a load current in excess of 80 amperes per phase, Current Transformer Metering shall be installed in accordance with Section 11, "Connection of Current Transformers and Current Transformer Metering".

To ensure that meters, installations and related equipment are correctly installed and connected, the following methods and procedures shall be adopted:-

METERING INSTRUCTION BOOK - SECTION 10
Pages 1 to 5 superseding existing pages 1 to 5.

METER CONNECTOR BLOCKS

(See "Metering Accessories", Section 1)

Use

Meter Connector Blocks shall be installed with each element of all direct connected polyphase meters and with every direct connected single phase meter where the meter size is not greater than 10/60 amps. and the cable size is not greater than 19/.044", with the following exceptions:-

(a) Stored Heat Rate meters.

(b) Restricted Hours Rate meters.

(c) Temporary metering.

Meter connector blocks shall also be installed when carrying out work on existing meters, however, existing "4 wire" single phase meters shall be rewired as "3 wire" meters prior to this being done.

Older type meter connector blocks will be found on some existing installations and the maximum cable size which may be connected to these is 7/.064". When it is necessary to connect a larger cable (19/.044" maximum) the block shall be replaced with one currently used.

Where 19/.044" cables are to be connected, meter connector blocks having a chamfered tunnel entry shall be used to ensure easy entry of the cable. The chamfer shall be made with a 5/16" drill and stocks of such blocks shall be held at each depot for issue as required.

Mounting

All meter connector blocks shall be mounted below the cable entry holes in the meter board with one 1¼" x 7 gauge countersunk wood screw with the cutaway side of the block uppermost as shown in figure 1. On most standard meter boards the position of the meter connector block fixing holes is marked.

However, when installing meter connector blocks with some existing meters, they may have to be mounted above the cable entry holes in the board as shown in figure 2.

To enable meter connector blocks to be connected to existing meters, the short terminal covers shall be replaced with long covers, however, where space is not available for this, the meter connector block may be installed under the short terminal cover on single phase meters only. In these cases the block need not be secured to the board but may be left loose and positioned in such a manner that the short terminal cover may be replaced.

If, in special circumstances, meter connector blocks are to be mounted on a composition panel, 1¼" x 5/32" dia. metal thread screws and nuts shall be used.

Connections

The meter connector block terminals are not marked and for ease of identification they are designated 1 to 6 from left to right. The connections are as shown in figure 3.

The connections between meters and meter connector blocks shall be made with single core cable as follows:-

1. Domestic installations - 7/.044".

2. All other installations - 195/.010".

To facilitate connections, a loop must be made in these cables thus ℓ , and for the purpose of these instructions they will be called "pigtails".

Each "pigtail" shall be 6¾" long. One end shall be bared to a length of ½" for connection to the meter connector block and the other to a length of 1" for connection to the meter terminal.

Both ends of the 7/.044" "pigtails" shall be bound whilst both ends of the 195/.010" "pigtails" shall be solder dipped.

The "pigtail" between the line terminals of the meter and the meter connector block shall always be coloured white. The load terminal connections may be made with cables of any other colour.

The maximum size cable that may be connected to a meter connector block is 19/.044", therefore, when cables in excess of this size are provided by the customer, reducing lugs shall be used with single phase meters. Reducing lugs must never be used with polyphase meters.

However, there is no alternative to using a polyphase meter for two rate metering or when the meter disc rotation is reversed due to welder or other highly inductive loads being connected, even though the cable size is greater than 19/.044". In these cases, the cables shall be connected to the meter direct without the use of meter connector blocks.

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Bridging of Meter Connector Blocks

When replacing meters where meter connector blocks are installed, the supply shall be maintained by bridging the line and load sides of the block with a connection between terminals 3 and 4 (see figure 3). Care must be taken that a short circuit does not occur between the adjacent neutral conductor and the active "pigtails" and between "pigtails" of opposite polarity with a polyphase meter.

Before removing any polyphase meter, all "pigtails" shall be completely removed.

The line"pigtail" shall be removed first by disconnecting at the meter connector block and then the meter. The load "pigtail" shall then be removed in a similar sequence.

Note: Whilst the bridge is inserted the meter will remain alive until the load "pigtail" is removed from the meter connector block.

With a single phase meter it is generally only necessary to remove the neutral conductor from the meter and turn it back through the hole in the meter board. The "pigtails" may then remain connected to the meter connector block whilst the meter is changed.

Note: After all meter replacements, the appropriate checks for phase sequence, disc rotation and a check of the customer's switchboard must be carried out.

METERING INSTRUCTION BOOK - SECTION 10
Pages 1 to 5 superseding existing pages 1 to 5

Metering Instruction Book - Section 10

Superseding Existing Figure 1

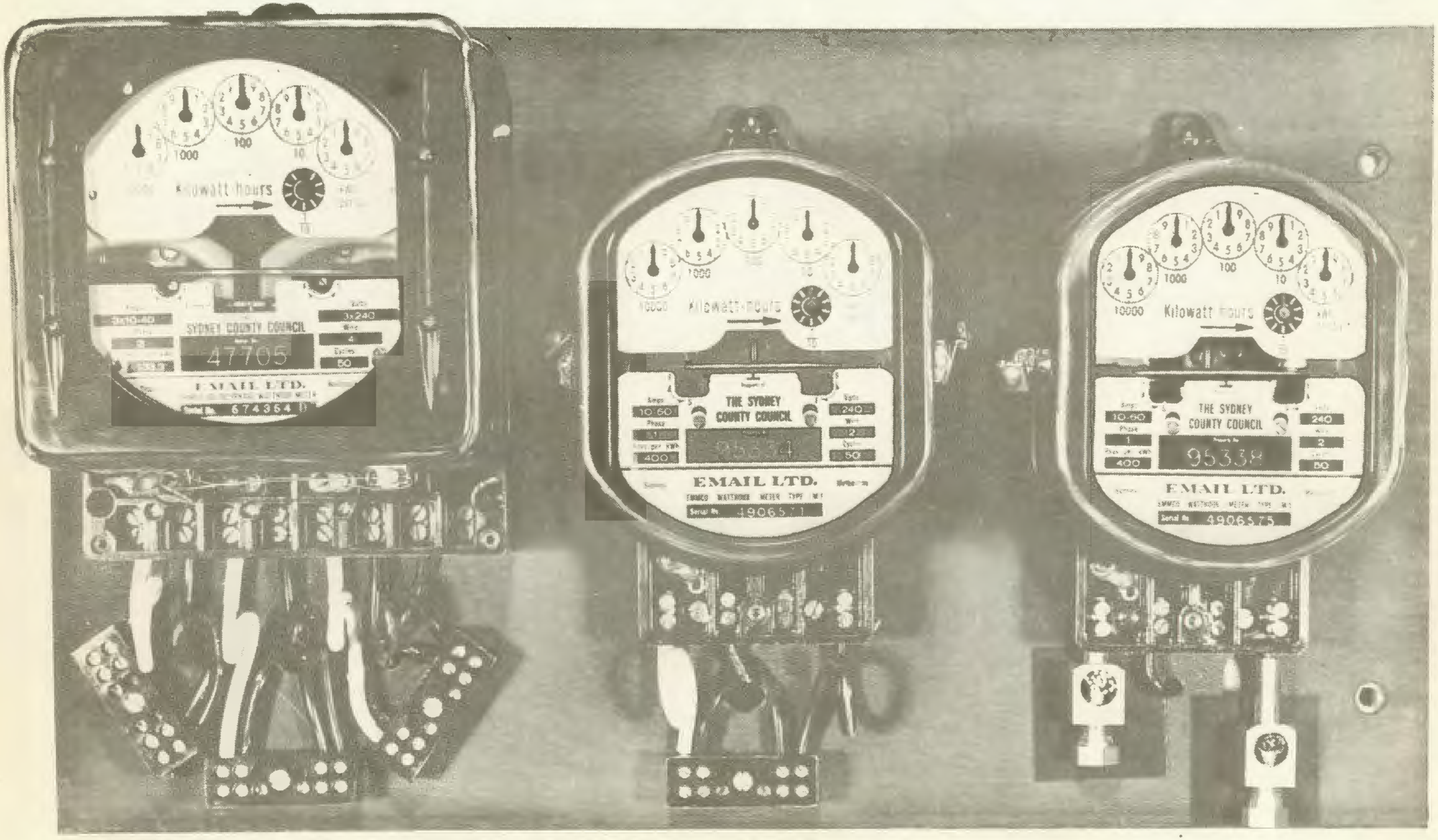

FIGURE 1.

Polyphase Meter
With Connector
Blocks

Single Phase Meter
With Connector
Block

Single Phase Meter
With Reducing
Lugs

Section 10
(Amdt. No. 16 1.8.1967)

Metering Instruction Book - Section 10
Superseding Existing Figure 2

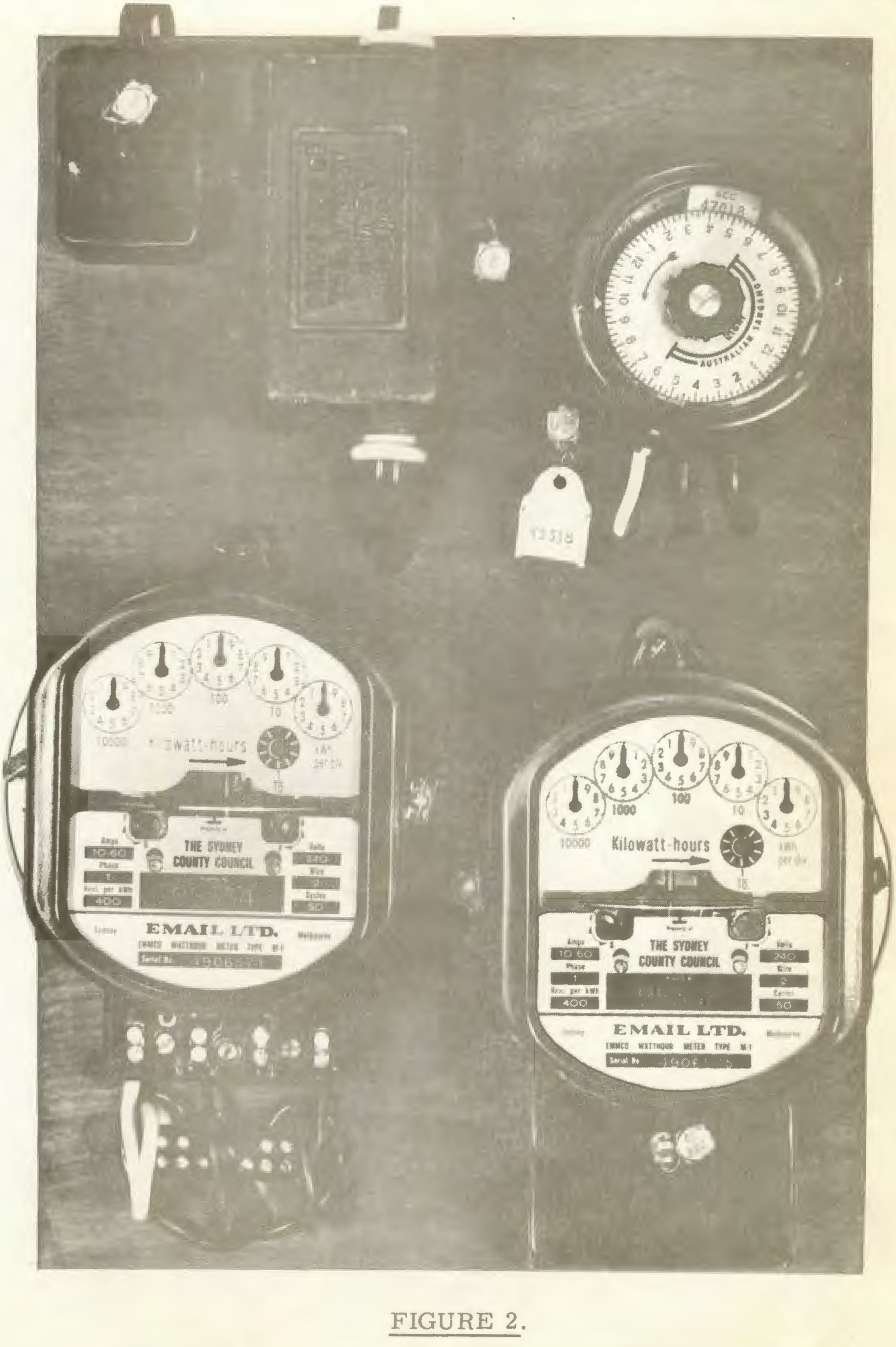

FIGURE 2.

Typical Domestic Installation Showing Meter Connector Block Installed On Existing Meter

(Amdt. Nº 16 1.8.67

Superseding existing cir. diagram 3

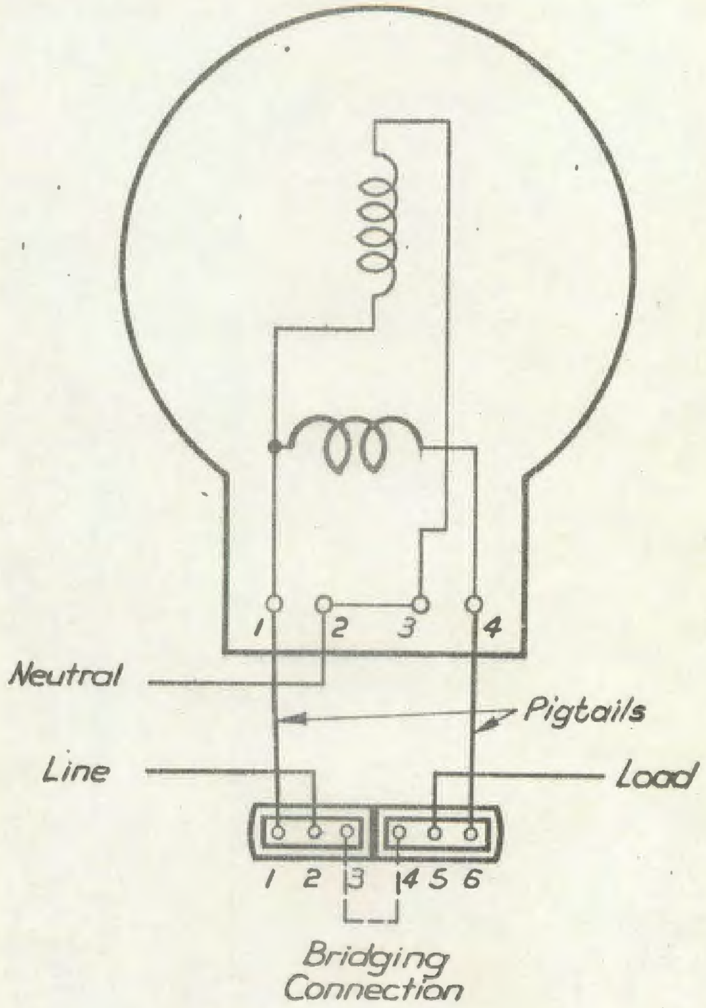

FIGURE 3

SINGLE PHASE METER AND METER CONNECTOR BLOCK SHOWING CONNECTIONS

METERING INSTRUCTION BOOK SECTION 10
Pages 1 to 5 superseding existing pages 1 to 5

REDUCING LUGS

(See "Metering Accessories", Section 1)

The maximum size cable which may be connected to a reducing lug is 37/.064".

Reducing lugs shall be installed with each single phase direct connected meter where the cable size is greater than 19/.044" and with each single phase direct connected meter having a rating greater than 10/60 amps.

Installation

The installation must be carried out as shown in figure 1 of this section and figure 3 in Section 14.

The hole in the meter board for the cable shall be slotted to a depth sufficient to allow the easy withdrawal of the reducing lug from the meter terminals, at least $1\frac{1}{4}$".

The insulating masking piece must be placed over the cable before it is inserted in the lug. This will cover the slot in the meter board to prevent inadvertent contact with the live lug from the rear of the board, and the possible theft of electricity.

Where possible, the bared cable ends shall be bound with sealing wire to prevent spread of the cable strands in the tunnel terminal of the lug.

Extended meter terminal covers must always be used with reducing lugs.

"Double Battens" must be used with all meter board where the cable size is greater than 19/.044. See Section 14, "Battens".

Bridging Between Reducing Lugs

When replacing meters where reducing lugs are installed, the supply shall be maintained by bridging between the lugs with a jumper connected to each of the $\frac{1}{4}$" dia. Whit. terminals with metal thread screws. These jumpers are available at each depot.

Care must be taken that a short circuit does not occur between the adjacent neutral conductor and either of the exposed and energised reducing lugs. Contrary to the general rule, in this case, the neutral conductor shall be removed first and replaced last. When removed, it should be turned back through the meter board or satisfactorily taped.

METERING NEUTRAL CONDUCTOR AND THE NEUTRAL CONNECTOR BOX

(See "Metering Accessories", Section 1)

The neutral conductors from each meter, time switch, relay or other instrument must be connected into the main service neutral link on most simple metering jobs on 50 amp. services. However, where due to the number of instruments connected or where the service neutral link is not designed to accommodate several conductors, a neutral connector box or boxes will be used.

Connections

The neutral conductor from the service neutral link must be connected into one of the main two screw terminals, and where more than one connector box is connected in parallel, the extended neutral conductor shall be connected to the same two screw terminal. By this means up to 8 instruments may be connected to each box.

Mounting

Neutral connector boxes shall be mounted with one 1¼" x 7 gauge countersunk wood screw on the fillet strip on multi board installations as shown in figure 2, Section 14.

Sufficient length of cable must be left on the neutral conductors so that the fillet strip may be removed to give access to the wiring at the rear of the meter board.

When fillet strips are not used, the neutral connector box shall then be mounted in a convenient place on the meter or service board.

SELECTION OF METERS

(See description of Alternating Current Meters in Section 4 and "Issue of Meters" in Section 12).

The whole current meters in general use are the single phase, 2 wire kilowatt-hour meter and the three phase, 4 wire and the two phase, 3 wire kilowatt-hour meters. These meters are also available, in certain ratings (sizes), as two rate meters and combined energy-kW demand type meters, which are described in Section 4, "Alternating Current Meters".

DIRECT-CONNECTED METERING

SELECTION OF METERS (Continued)

1. General (Continued)

Direct-connected meters shall in general be used for metering loads which are not likely to exceed 100 amperes per phase maximum demand, ignoring short-time fluctuations.

The selection of direct-connected meters for installation shall be in accordance with the following:-

2. Basis For Assessment of Load. In general, the load shall be taken to be the calculated "maximum demand in mains and sub-mains" determined in accordance with S.A.A. Wiring Rule 2.5. Some discretion may be used by the appropriate supervisor where it is clear that the operating characteristics are such that the load will differ from this assessment.

3. Requirement of C.T. Metering. In order to minimise the risk of having to re-meter within a relatively short period, C.T. metering shall be used where new metering is necessary in commercial and industrial premises if the load is assessed at more than 80A/phase and there is potential for growth.

In the case of domestic loads and loads with no potential for growth, C.T. metering shall be used where the load is assessed at over 100A/phase.

4. Preference For Use of Single Phase Meters. In general, single phase meters shall be used in preference to two and three phase meters wherever practicable. Exceptions shall be as indicated in Clause 5.

4.1 New Installations. Where the installation is new or facilities for plug-in meters have previously been provided and it is appropriate to use direct-connected single rate energy meters, 15/100 ampere plug-in meters shall be used.

Two rate tariff meters are available only in the bottom-connected design. Where it is appropriate to use them in addition to plug-in meters, the customer shall be requested to provide suitable space on a meter panel, preferably portion of a hinged modular panel also used for socket metering. However, the use of one of the alternative forms of panel construction described in Note 4 of Drawing Ref. No. E.I. 101 (attached to Publication E.I. 8) is satisfactory.

It shall be assumed that the customer will have been required to provide facilities for plug-in metering if the service to the premises was marked for initial supply after the end of May, 1978 in the case of commercial, industrial and multiple domestic premises and after the end of October, 1978, in the case of single residences.

4.2 Additions. Where it is appropriate to use bottom-connected meters on the premises, meters shall be selected in accordance with the following table:-

1 TYPE OF LOAD	2 METER RATINGS SUITABLE (AMPERES)	3 BOTTOM-CONNECTED METER TO BE SELECTED
Steady loads such as off-peak water heaters and space heating.	10/40 10/60 10/70 10/80 15/100 *20/100 *25/125	The lowest rated available meter of those listed in Column 2, the rating of which is not less than the total rated load plus 10A, subject to use of C.T. Metering in accordance with Clause 3 if applicable.
Single residences, home units and individual flats.	10/60 10/70 10/80 15/100	The lowest rated available meter of those listed in Column 2, the rating of which is not less than the load as defined in Clause 2.
Commercial and Industrial loads such as factories, offices, shops and institutions.	10/60 10/70 10/80 15/100 *20/100 *25/125	The lowest rated available meter of those listed in Column 2, the rating of which is not less than the load as defined in Clause 2 plus 10A, subject to use of C.T. Metering in accordance with Clause 3 if applicable.

*To be regarded as equivalent to 15/100 for the type of load concerned.

5. Use of two and three phase meters

5.1 General. A two or three phase direct-connected meter, as appropriate, shall be installed where:-

i) it is necessary to use it to avoid involving the customer in expensive alterations to provide space for additional single phase bottom-connected meters and the need for additional space can be avoided by using a polyphase meter.

ii) the customer takes supply at a tariff such as Process Heating Tariff with Night Usage, for which a two-rate polyphase meter will be used.

NOTE: Disc reversal can occur on one of a set of single phase meters used to meter a 2 or 3 phase supply across two phases of which a 415 volt inductive load is connected. The possibility of this occurring should not alter the initial selection of meters. Should a negative reading be reported to have occurred, the matter shall be referred to the S C S who will take appropriate action after considering whether to negotiate with the customer for a re-arrangement of wiring to transfer 240 volt load to the extent necessary to ensure that a negative reading is unlikely to occur or for the meters to be replaced with a polyphase meter.

5.2 Available Two and Three Phase Meters. These are as follows:-

SD types -	10/40, 10/60 and 15/60A
L & G type (large frame size, converted from two-rate) -	15/100A

This Instruction supersedes pages 7, 8 and 9 of the Metering Instruction Book as amended 24th April, 1979.

METERING INSTRUCTION BOOK - CTION 10.
Amendment No. 36, 24th Sept., 1979. Supersedes pages 7, 8 & 9.

MOUNTING OF METERS

All instruments shall be mounted on the standard meter boards as described in Section 14, and as detailed for the particular instrument where described in this book. They may also be mounted on existing boards provided adequate space exists and the usual requirements of access etc. are available.

When an additional Stored Heat Rate A meter and time switch are added to an existing domestic installation where the old type 18" x 12" wide board is installed, the meters, service neutral link and fuse shall be rearranged as shown in figure 2.

The Service Rules must always be complied with except in some unusual circumstances on the instruction of a supervisor.

A clearance of two inches must be maintained between S.D. type Polyphase meters so that the balance adjustments mounted in the sides are accessible. Single phase meters, except the BAZ two rate meter mounted in a S.D. type case, may be mounted immediately adjacent to the S.D. type polyphase meter without causing obstruction. See figure 2 Section 14.

Where three S.D. type polyphase meters are mounted on the 12" x 26" wide board, the spacing must be as follows:- The middle meter must be mounted on the centre line of the board, the left and right meters must then be spaced 1½" from either end. This will ensure adequate clearance if other boards with S.D. type meters are fixed in a horizontal row with vertical edges abutting. This arrangement is shown in figure 2, Section 14.

Any meters for the supply to passenger conveying lifts shall be kept together in a separate group from other meters. Where both lifts and house lighting supplies are metered through the same set of meters, these shall be treated as "lift" meters.

The meter wiring involving the lift circuits must also be kept separate and not intermixed with other meter wiring. There is, however, no objection to left meters being fixed to the same meter board as other meters. Provided they are in a distinct group and separation of meter wiring is maintained, they may be adjacent to other meters.

CONNECTIONS OF METERS AND INSTALLATIONS

All instruments shall be connected as shown in the connection diagram for the particular meter, time switch, relay etc. In addition the circuit diagrams in Section 25 shall also be followed where applicable for various rates and methods.

There is one exception however, where a Stored Heat Rate A meter and time switch is added to an existing domestic installation, and the domestic rate meter, service fuse and neutral link have been rearranged, the customers main neutral conductor may not be long enough to reach the neutral service link, and in this case it may be connected to the meter neutral terminal No. 3, making the meter a "4 wire" meter. Alternatively, it may be joined in a link mounted on the board and connected to the neutral service link in the normal manner. A meter connector block need not be installed with single phase meters wired as "4 wire" meters.

In conjunction with Section 8, "General Metering Instructions", the following procedure shall be adopted to ensure that all whole current meters and installations are correctely connected:-

For the detailed method of wiring and connecting meters on the Hinged Service Board, See Section 14.

N.B. (a) A polyphase meter shall not be connected unless all of the potential coils are energised.

(b) Before commencing work on existing installations, the main switch must be checked that it controls the active conductor or conductors. If it is found to be incorrect, it must be left in that manner and the supervisor notified.

Tests During and on completion of Metering; Supply Available

See Section 8, "Authority for Connection of Supply after Metering".

In the case of whole current metering, where supply is available, the Connecting Officer shall carry out the following checks and tests during the progress of, and upon completion of the meter wiring.

For the procedure where supply is not available, see page 14 of this section.

N.B. A check must be made of all testing equipment prior to and on completion of any test to ensure that it is in working order, e.g. test lamps etc.

1. Check with test lamps to establish that the supply neutral is connected to the Council's neutral service link or bar and that it is at approximately earth potential. If necessary, run a length of sealing wire to a known earth such as a water pipe, for this test.

2. Check with test lamps between the neutral service link and each phase service fuse to ensure that 240 volts is available. In the case of polyphase installations, also check that 415 volts is available between phases.

NOTE. This procedure in 1 and 2 above shall also be carried out on metering links, where installed, as the point of supply for metering.

3. If polyphase meters are to be connected, check the phase sequence of the service fuses, links etc. with the phase sequence indicator and note the result in accordance with Section 9, "Phase Sequence and Phase Relationship".

4. Trace the customer's neutral conductor and connect it to the neutral service link. The customer's neutral link must then be checked with test lamps to ensure that it too is at approximately earth potential. If necessary, run a length of sealing wire to a known earth, such as a water pipe, for this test.

NOTE. The check on the customer's neutral link should also be made prior to making this connection as a low insulation resistance between earth and any portion of the customer's installation may give a false result.

5. Connect all metering neutral conductors.

6. Connect all meter line conductors to the line terminal of the meter meter connector block or to the meter by means of a reducing lug as appropriate.

7. Where meter connector blocks are installed, connect the white coloured line "pigtails" between the meter connector block and meter line terminals.

8. If the unmetered mains etc. may be connected, energise the meter and, with test lamps, ensure that the metering neutral conductor is connected to the meter neutral terminal and that the active line conductors are connected to the correct line terminals. With a polyphase meter, 415 volts must be available between the VACANT LOAD TERMINALS of each element.

NOTE: Before energising links to which individual customers are to be connected, care must be taken to remove all conductors which are not in use or connected to the line side of a meter.

9. Having proved that all line conductors are in their correct respective positions, check with the phase sequence indicator that the phase sequence is correct at the line terminals of each polyphase meter.

10. With the single phase test load (100W lamp) applied between earth or any verified NEUTRAL TERMINAL and each VACANT METER LOAD TERMINAL in turn, check that the meter disc turns in the correct direction as indicated by the arrow adjacent to the disc, in respect to each single phase meter and to each element of a polyphase meter.

If the disc fails to turn and the test load lamp glows, ensure that the small screw in the potential coil link on the terminal block is tight. Failing this, the meter must be treated as defective, and treated as described in Section 12.

11. Connect the load "pigtails" between the meter connector block and the meter and if, in accordance with Section 8, "Authority for Connection of Supply After Metering", the load conductors may be connected, these connections shall now be made.

12. If the load conductors have been connected and energised, check with test lamps that 240 volts is available between the customer's neutral link and each active line terminal of the customer's main switch, and that 415 volts is available between each of the active terminals of the main switch in a polyphase installation.

13. Seal and label all instruments. See Section 13, "Sealing and Labelling".

14. If the phase sequence and disc rotation of polyphase meters have been found correct, affix the phase sequence sticker to the middle, left hand side of the meterglass (see note below), and initial the phase sequence symbol shown against the details of each meter on the run sheet. See further details of the Metering Record Sheet (run sheet) in Section 12.

15. If the disc rotation of single phase meters has been found correct, initial the phase sequence column against the details of each meter on the run sheet. Note: The phase sequence symbol will not be shown in this column for single phase meters.

16. Complete all entries on meter test cards, run sheets etc., prior to leaving the job. For full details of these documents, See Section 12.

METERING INSTRUCTION BOOK
Superseding existing page 13.

If the meter load conductors or service fuses have been "sealed out", the letters "H.N.C." must be made against the meter entries on the run sheet.

If the metering being completed was previously "H.N.W." (hung not wired), all meter entries must be made on the run sheet and the words "previously fixed" written against them.

Metering will be classed as "complete" if all tests at the meter have been carried out and the only work outstanding is the connection of the load conductors to the meters and the subsequent tests at the main switch as in clauses 11 and 12 above. In all other cases the metering shall be classed as "incomplete".

NOTE: When a Connecting Officer calls at a premises to fix a polyphase meter or meters he shall, after conducting all the tests prescribed for polyphase meters, affix to the glass face of each meter, an adhesive sticker bearing the anticlockwise phase sequence symbol. The sticker must be placed in the middle left hand side so as not to obstruct the register or name plate. (See "Metering Accessories", Section 1).

When a Connecting Officer visits a job in the course of being metered he shall observe if stickers are fixed on all polyphase meters in the location where he is working. Where it is noticed that a meter does not bear a sticker, the Connecting Officer shall carry out all the tests and affix a sticker to the meter (or meters) involved. A record of the meters shall be shown on the run slip and the Connecting Officer shall place his initials in the "phase sequence" column to indicate that the required checks have been completed.

This procedure will assist in ensuring that in future all polyphase meters are correctly connected, particularly when large jobs are connected progressively and supply is made available to groups of polyphase meters in varying stages.

On completion of his day's work the Connecting Officer will return his run slip and all other documents to the Leading Hand Connecting Officer. The Leading Hand Connecting Officer shall place the phase sequence symbol in the appropriate column of the run slip for each meter checked, and shall note details on the C.I.I. 126 forms that he is holding for jobs involving meters not previously checked for phase sequence, which have been covered by the entries on the run slip returned by the Connecting Officer. When all meters have been checked the C.I.I. 126 form shall be cancelled.

Each Connecting Officer shall ensure that he carries with him, at all times, an adequate supply of stickers.

If the meter load conductors or service fuses have been "sealed out", the letters "H.N.C." must be made against the meter entries on the run sheet.

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Each Connecting Officer shall ensure that he carries with him, at all times, an adequate supply of stickers.

METER WIRING COMPLETE, Supply Not Available

Where supply is not available to carry out the phase sequence and disc rotation tests on a polyphase meter or the disc rotation test on a single phase meter as shown in clauses 9 and 10 above, the Connecting Officer, after completing the wiring of all meters, shall proceed as follows:-

The Connecting Officer shall mark the original C.I.I. 126 form "incomplete" and make out an additional form requesting that appropriate checks be made on the meters as listed when supply is connected.

He shall attach the second form to the front of the original and forward them as "incomplete work" in the front of the run sheet with the day's work.

The phase sequence symbol shown in the sequence column of the run sheet shall not be initialled in the case of polyphase meters, nor shall the vacant space in this column be initialled in the case of single phase meters.

The letters "H.N.C." (hung not connected) must be shown on the run sheet against the meter entries for the job and a further note, "126 L/H", shall be made in this position to signify that a C.I.I. 126 form has been given to the Leading Hand requesting that the tests be made when supply is connected.

The Leading Hand shall extract the additional form from the run prior to the work being forwarded to the Planning Clerk. This will be held in the area concerned and the Foreman shall at intervals not exceeding one week, ascertain if supply has been connected and if so, arrange for all tests to be completed.

When reissued, the Leading Hand shall show all meters required to be tested on the run sheet and shall place the phase sequence symbol in the sequence column against each polyphase meter.

The Connecting Officer shall then follow the procedure shown on previous pages, "Tests During and on Completion of Metering, Supply Available".

METERING IN PROGRESS

When large metering installations cannot be completed in one day, they shall not be treated as "incomplete" but as metering "in progress", providing the following items are adhered to:-

(a) The time between the issue of the meters and the completion of the job must not exceed 5 working days.

(b) The words "in progress" must be written against the name and address of the customer concerned on each day's run sheet until completion of the job.

(c) The numbers and types of instruments must be written on the run sheet on the day of their issue, e.g. 25 BAZ, 10/60 meters.

(d) Meter test cards must remain attached to all instruments until they are about to be completed on the final day.

(e) On the final day, all entries must be completed on the run sheet and meter test cards which will be returned with the C.I.I. 126 form in the usual manner.

METERING INCOMPLETE

(a) R.F.T. Received

A "Ready for Test" certificate shall be deemed as having been received unless the statement "Not R.F.T." is stamped across the bottom of the C.I.I. 126 form.

If for any reason the metering cannot be completed, e.g. battens incorrectly fixed; insufficient cable etc., the Connecting Officer shall mark the original C.I.I. 126 form "incomplete" and make out an additional form showing the work required to complete the job, e.g. "Neutral cable for S.H.A. rate meter and time switch not provided".

The second form shall be attached to the front of the original and forwarded to the Leading Hand as "incomplete work" in front of the run sheet with the day's run.

Where meters have been hung in position but not completely wired, the letters "H.N.W." (hung not wired) shall be written on the run sheet against the meter entries.

The Foreman or Leading Hand shall be notified of all cases of incomplete metering, where the R.F.T. has been received, immediately the Connecting Officer returns to the office. The Foreman or Leading Hand must then inform the Planning Clerk who will in turn inform the Installation Inspector so that he may take appropriate action.

The additional C.I.I. 126 form shall remain attached to the original so that the Planning Clerk may relate it to the defect sheet dealing with the incomplete work.

However, if a Connecting Officer is working with an Installation Inspector, he shall give him the additional C.I.I. 126 form (attached to the original) so that it may be attached to the copy of the defect sheet immediately.

When this is done, the words "126 - I.I." must also be written on the run sheet.

(b) R.F.T. Not Received. (Pre Metering, Section 12, Page 10)

In large installations, the meters are quite often installed prior to the R.F.T. being received. In these cases, before issuing the C.I.I. 126 form for the job, the Leading Hand shall stamp across the bottom of the form "Not R.F.T.".

If for any reason the metering cannot be completed, the Connecting Officer shall make out a new C.I.I. 126 form and follow the procedure above for "R.F.T. Received".

However where meters are recorded on the run sheet, the new C.I.I. 126 form must be made in duplicate.

The new forms shall be attached to the front of the original C.I.I.126 form and forwarded to the Leading Hand as "incomplete work" in front of the run sheet with the day's run.

Where the new C.I.I. 126 form has been made in duplicate, the Leading Hand shall stamp one of them "Not R.F.T." and return it with the run to the Planning Clerk.

The original form with the other new C.I.I. 126 form attached to the front shall be held pending further notification from the electrician or customer, or receipt of the C.I.I. 118 form from the Planning Clerk.

When the R.F.T. has been received and the job is issued to complete, the Leading Hand must cross out the words "Not R.F.T."

The Connecting Officer shall then treat the job in accordance with the procedure laid down in this section as applicable.

NOTE: When completing metering which was previously "H.N.W." the Connecting Officer shall show all meters on the run sheet as being "fixed", and add the words "previously fixed".

CONNECTION OF CURRENT TRANSFORMERS AND CURRENT TRANSFORMER METERING

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Selection of C.T.'s. Page 4

Delivery of C.T.'s not Involving Connection of Meters Page 5

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Connection of Customers Mains to C.T.'s and Service Fuses or other Points of Supply Page 17

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1. Metering Neutral Conductor Page 19
2. Connection of Potential Fuses to Point of Supply Page 20
3. Connection between Potential Fuses and Test Block and between Test Block and Meters Page 22
4. Connection of Secondary Current Circuit Conductors Between C.T.'s and Test Block Line Terminals Page 23
5. Connection of Secondary Current Circuit Conductors Between Test Block Load Terminals and Meters Page 24
6. Connection of M.D.I.'s. Page 25
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CONNECTION OF CURRENT TRANSFORMERS AND CURRENT TRANSFORMER METERING

When an installation has a sustained load current in excess of 80 amperes per phase, Current Transformer Metering shall be installed in accordance with this Section 11, and with Section 8, "General Metering Instructions" and with the section relating to a particular rate where applicable. See also Section 25 for the appropriate circuit diagram.

When an installation has a sustained load current less than 80 amperes per phase, Direct Connected (Whole Current) Metering shall be installed in accordance with Section 10,"Direct Connected (Whole Current) Metering".

To ensure that C.T's and related equipment are installed in a satisfactory manner and that the meters and installations are correctly connected, the following methods and procedures shall be adopted:-

NOTIFICATION OF METER BRANCH OF C.T. METERING

The Meter Branch will check the installation and alteration of all C.T. metering, and as a means of notifying that branch of any work carried out, the following procedure shall be followed by Foremen and Leading Hands and other officers concerned:-

NOTE: In those cases where the only work involved is to change the tapping on C.T.'s to which are connected meters having an external constant (K), it is preferable to request the Meter Branch to change the tap when they call to change the "K" tag on the meters.

(a) All I.126 forms requesting the fixing, changing, or alteration of C.T. metering in any way shall be prominently marked in RED with the stamp provided, "C.T. JOB". It is the duty of the officer making out the form to do this, nevertheless, the officer compiling a Connecting Officer's run must ensure that it is so stamped prior to issue.

(b) The meter requisition slip, I.37, shall be made in duplicate for each job. One of these must be prominently addressed "M.S./F.M.I."

See also Section 12, "Requisition of Meters".

(c) An additional white copy of the Connecting Officer's run sheet, (I.10) shall be made out and forwarded with the two meter requisition slips to the Meter Storeman. This sheet shall show the meter and C.T. particulars against the customer's name and address. In addition, one or more of the following code letters shall be shown against the metering particulars to denote the type of work carried out:-

(i) Existing C.T. Installations

C/M	Change of meter only for type
C/T & M.	Change of C.T. tapping and meter
C/T & K.	Change of C.T. tapping and meter constant
A.	Alteration to position or connections of C.T.'s and/or meter
N.	Physical change of C.T.'s for any reason

(ii) New C.T.'s Installed

N.	Completely new installation
N.	Physical change of C.T.'s for any reason

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N.	Change from direct connected to C.T. metering
D.	Delivery of C.T.'s and potential fuses for mounting by electrician or switchboard manufacturer, not involving the connection of meters.

See also "Delivery of C.T.'s and Potential Fuses", page 5.

(d) Where new meters are not required, i.e. alterations to position of existing meters, C.T.'s etc. particular care must be taken to ensure that the additional copy of the I.10 run sheet is sent to the M.S./F.M.I. This is best done via the meter store in the area concerned.

(e) In cases where the Foreman or Leading Hand has noticed that it would be hazardous for the Meter Inspector to carry out his checks after the installation is energised, and where it would be difficult to arrange any further disconnection of supply or, where difficulty may be experienced in gaining access to the premises, e.g. M.W.S. & D.B. pumping stations, he shall notify the Supervisor Meter Testing or the Foreman Meter Inspector so that the Meter Inspector can be present when the metering work is being carried out.

The Connecting Officer shall, as mentioned later in this section, on completion of a C.T. metering job, leave all completed test cards sealed to one of the test block cover studs. All other papers must be returned with the "run" in the usual manner.

The Planning Clerk will, on receipt of the completed I.126 form marked "C.T. JOB", telephone the Foreman Meter Inspector and inform him that the job has been completed. This will ensure that the Meter Branch is notified of the job in the event of the previous methods having gone astray, and also as a reminder to the Meter Branch that the test cards are required by the Planning Clerk for checking purposes.

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SELECTION OF CURRENT TRANSFORMERS

(See description of the various types of C.T's in Section 6)

The C.T's in general use are the multi-range encapsulated "ring" of "tunnel" type which shall be used in all cases. However, where the installation of the standard C.T. in an existing installation is found to be impracticable, the matter shall be referred to the Supervisor Metering who may approve the use of the older type C.T's which are illustrated in Section 6, figures 4, 5, 6 & 7.

Supervisors shall ensure that the current rating of the tapping in use is not exceeded

DELIVERY OF CURRENT TRANSFORMERS AND POTENTIAL FUSES, NOT INVOLVING CONNECTION OF METERS

Requests are often received from the Technical Section, electricians and switchboard manufacturers for the delivery of C.T's and potential fuses so that they may be fitted during the construction of a switchboard.

These requests may be granted if:-

(a) An application for supply has been received from the person for whom the switchboard is being constructed. It may be taken for granted that an application has been received when the delivery request has been made by the Technical Section.

(b) On delivery, the Foreman or Leading Hand is satisfied that the mounting position of both the C.T's and potential fuses will be satisfactory.

(c) A receipt is given for delivery of the C.T's and potential fuses. A duplicate memo book shall be used for this purpose. The original page must be left with the recipient. The receipt must show the name and address of the customer, the name of the person or firm to whom they are delivered, the C.T. numbers, the date and the signature of the person taking delivery.

(d) A plain label is attached to each C.T. giving the customer's name and address and the rate at which they are to be connected.

(e) The secondary terminals are bridged. This will protect the C.T. in the event of their being inadvertently energised prior to the connection of meters.

As mentioned previously on page 2, "Notification of Meter Branch", the meter requisition slip, I.37 shall be made in duplicate and, with a copy of the I. 10 run sheet showing the code letter "D", and addressed "M.S./F.M.I.", attached shall be given to the Meter Branch Storeman.

As it is usually a week or two before the C.T's are actually connected and the metering installed, details of the C.T's must be given to the Planning Clerk so that he may record them on the service card. The meter check slip showing the C.T. numbers will not then be outstanding.

The test cards must therefore, be detached from the C.T's and the customer's name and the installation address written in the space provided on each. The cards must not be signed or dated.

An I. 170 slip shall be attached to the front of each test card in a position not obscuring the name and address, and with the run sheet attached, shall be forwarded to the Planning Clerk.

The address on the I. 170 slip must be amended so that the test cards will return to the F.I.I./L.H.C.O. concerned. The F.I.I./L.H.C.O. shall hold the I. 126 form or other papers, pending the R.F.T. or other notification re metering.

MOUNTING OF CURRENT TRANSFORMERS

The C.T. must be mounted as described for the particular type in Section 6, "Current Transformers".

The "line side" of each C.T. is always the polarity side.

It may be found in some cases that the C.T's have been mounted in the switchboard prior to the Connecting Officer's visit. In these cases, a supervisor will have provided the switchboard manufacturer or electrician with the C.T's and potential fuses so that they may be built into the switchboard during manufacture. The Supervisor will have checked that the proposed mounting position for the C.T's and fuses was satisfactory.

When selecting these positions, Supervisors shall adhere to the same general requirements relating to the meter positions and in particular, to the following points. At the same time however, a close liaison shall be maintained with the Technical Section so that the general arrangement of busbars and switchgear is electrically sound.

1. Busbars, cables, switchboard or other structures shall not render the C.T. secondary terminals inaccessible, dangerous or difficult to work upon.

2. Where C.T's are installed in an overhead position, such that they must be worked upon from a position immediately below, adequate and suitable space must be available for the use of a ladder if required or for a man to stand. In addition, adequate clearance must be given from live metal, or where this is not practicable securely fixed insulating barriers must be provided.

3. Where C.T's are enclosed in a metal cabinet, cubicle or other place requiring the opening or removal of a metal panel for access, the panel shall be of the hinged or removable type.

   The panel may be hinged providing it opens to an angle of not less than 90° and does not contravene the requirements of S.A.A. Wiring Rule 244 (a). The metal panel may be of the unhinged removable type providing all of the following conditions are complied with:-

   (a) The panel area must not exceed 9 square feet.

   (b) The dimension of any side of the panel must not exceed 4 feet.

   (c) The method of securing the panel must be such that, when the securing nuts or screws are removed, the panel will remain in position on bolts or pins fixed to the non removable section of the cabinet or cubicle.

(d) The securing devices shall be such that special tools are not required.

(e) To assist in its removal, a handle shall be fitted to the left and right extremities of the panel in positions above the horizontal centre line.

(f) Where any panel encloses C.T's which are not visible, the panel shall be clearly marked to indicate such enclosure. In addition, where a number of panels are involved, each shall be marked with the particular rate or customer.

Where more than one set of C.T's are installed they shall be identified with a meter tag or a label provided by the Council to indicate the rate or customer to which they are connected.

The secondary terminal covers shall be sealed by passing sealing wire through the sealing devices described for the particular C.T. in Section 6. See also Section 13, "Sealing and Labelling". This requirement shall be deemed to be complied with however, if the C.T's are enclosed by a sealable switchboard cover or door.

MOUNTING OF POTENTIAL FUSES

(See description of potential fuses in Section 1 "Metering Accessories")

The potential fuses shall be mounted within the potential fuse case with round-head metal thread screws and nuts and the whole assembly mounted with suitable screws to the supporting panel.

When C.T's are mounted on meter boards, the potential fuse case shall be mounted adjacent to them on the same board. If installed on a 12" x 21" wide board in the standard C.T. installation (Section 6, figure 2) or where two sets of C.T's are installed (Section 6, figure 3) care must be taken that the customer's neutral conductor, which may pass across the face of the board, does not obstruct access to the potential fuses.

If the C.T's are installed in a switchboard or other place, the customer must provide a supporting insulated panel suitable for fixing the fuse case in a position near the C.T's. The panel shall be so arranged that the back entry of the conductors into the fuse case is readily obtained.

The position selected for mounting the fuse case shall be accessible and such that the fuses may be withdrawn and worked upon with safety. It shall not be installed at a height greater than eight feet or less than eighteen inches from ground or floor level and the general requirements regarding the selection of metering positions and points 1, 2 and 3 regarding the mounting of C.T's shall be adhered to.

Where more than one set of C.T's and potential fuses are installed, they shall be identified with a meter tag or label provided by the Council to indicate the rate or customer to which they are connected.

In all cases the unprotected length of cable between the point of supply and the line side of the potential fuses shall be double insulated, shall be kept as short as practicable and shall not be associated with other cables.

The double insulated cable shall be provided by the customer except that in simple installations, (e.g. standard C.T. installation above or below a service cabinet), where the customer has failed to provide the cable, it will be provided by the Council. Connecting Officers shall carry sufficient double insulated 3/.036" cable for this purpose.

Foremen and Leading Hands shall ensure that the double insulated cable requirement is made clear on the I. 49 card and I. 126/118 forms.

The line connections shall be made at the top of the potential fuses when they are mounted vertically and to the left side when they are mounted horizontally.

The phase order of potential fuses shall be red, yellow, blue from left to right when mounted in a horizontal row and red, yellow, blue from top to bottom when in a vertical row. See "colour code" in this section.

The potential fuse case shall be sealed across the diagonal corners, however, prior to the use of the fuse case, potential fuses were mounted individually, in which case the sealing wire shall be passed under each fuse base in the groove provided and tied across the top of the fuse carrier and sealed in the usual manner. See section 13 "Sealing and Labelling". This requirement shall be deemed to be complied with however, if the potential fuses are enclosed by a sealable switchboard cover or door.

MOUNTING OF TEST BLOCKS

(See description of Test Blocks in Section 1, "Metering Accessories")

The Test Block must be mounted on the meter board either below or at the side of the associated meters and such that the neutral connection is on the left side. It must never be mounted above its meter. This arrangement will allow the Meter Inspector to connect test leads to the test block without having them pass across the face of the meter undergoing test.

If possible, test blocks must be installed so that each is related to the meter in circuit with it by reason of its position.

Cable entry holes must be drilled through the meter board at the top and bottom sides of the test block in the positions indicated by the terminals, with the exception of the neutral load terminal position as no connection is made there.

The test block shall be sealed by passing sealing wire through each of the cover studs and sealing them individually. See Section 13, "Sealing and Labelling".

SELECTION OF METERS

(See description of the various types of meters in Section 4)

The meters generally used by the Council for C.T. metering are either:-

(a) The 3 phase meter available with either single or dual registers (two rate). A 2 phase meter is occasionally used for X-ray and similar installations.

(b) Single phase, 240 volt meters.

(c) The combined energy and kW demand, 3 phase meters with either single or dual registers (two rate).

Polyphase meters shall be the standard meter for C.T. metering, however, from time to time it may be necessary to use single phase meters, in which case the policy will be advised by the Supervisor Metering.

With the exception of some two rate energy and energy-demand meters having a reading constant greater than one, the meters selected must be of the same current ratio as the C.T. tapping to which they are to be connected.

It should be noted that when these meters are used for C.T. metering, the connecting link will have been removed from between the line terminals and the potential coil terminals, the potential coil supply must then be taken from an external circuit.

MOUNTING OF METERS

The standard meter boards for the mounting of C.T. connected meters and their associated test block are the 18" x 21" wide board as shown on figures 1 and 2 and the 12" x 26" wide board as shown in figure 3.

The 18" x 21" board may be used in every case and must be used where larger meters may be required in the future, e.g. energy-demand meters.

The 12" x 26" board may be used only where it is required to match other 26" boards and where no future need to install any of the larger meters can be foreseen.

When it is intended to mount other meters under the 18" x 21" C.T. meter board such meters shall, for uniformity, be mounted on 12" x 21" wide boards with 4" x 21" fillet strips on the same battens.

The ends of all 12" x 21" boards, 18" x 21" boards and 12" x 26" boards, mounted alternately with fillet strips, may abut similar boards mounted alongside.

When single phase meters are used they shall be mounted in a horizontal row as shown in figures 1 and 3. The test block must always be mounted on the meter board either below or at the side of the associated meter. It must never be mounted above its meter. *

All meters must be spaced from heavy current carrying conductors in accordance with Service Rule 11.

Individual holes shall be drilled in the meter board for each cable and such holes shall be drilled as low as the meter terminal cover will allow.

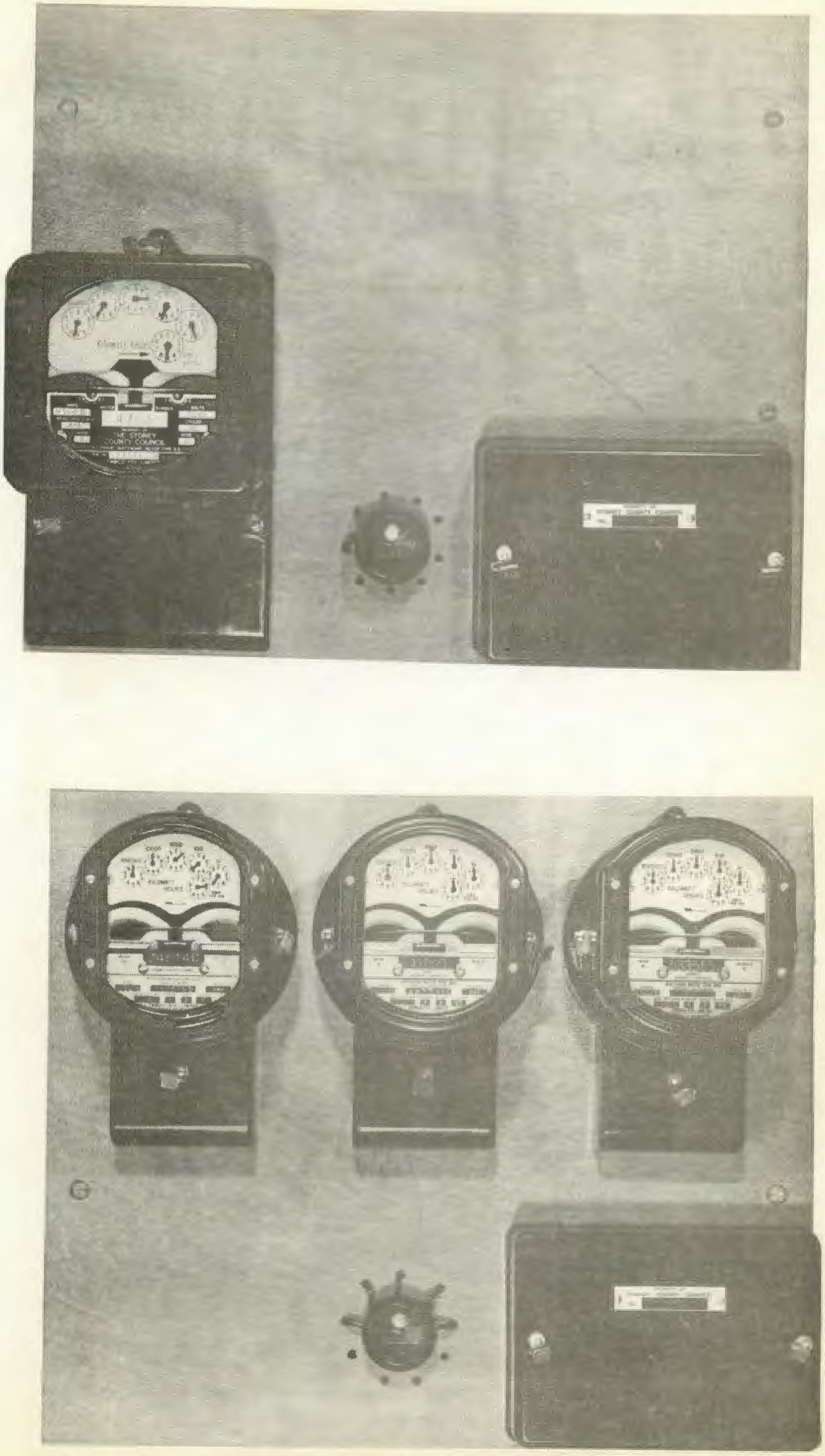


FIGURE 1.
STANDARD INSTALLATION OF POLYPHASE AND SINGLE PHASE METERS ON 18"x 21" WIDE BOARDS.

(Amdt. No. 19, 1·4·09)

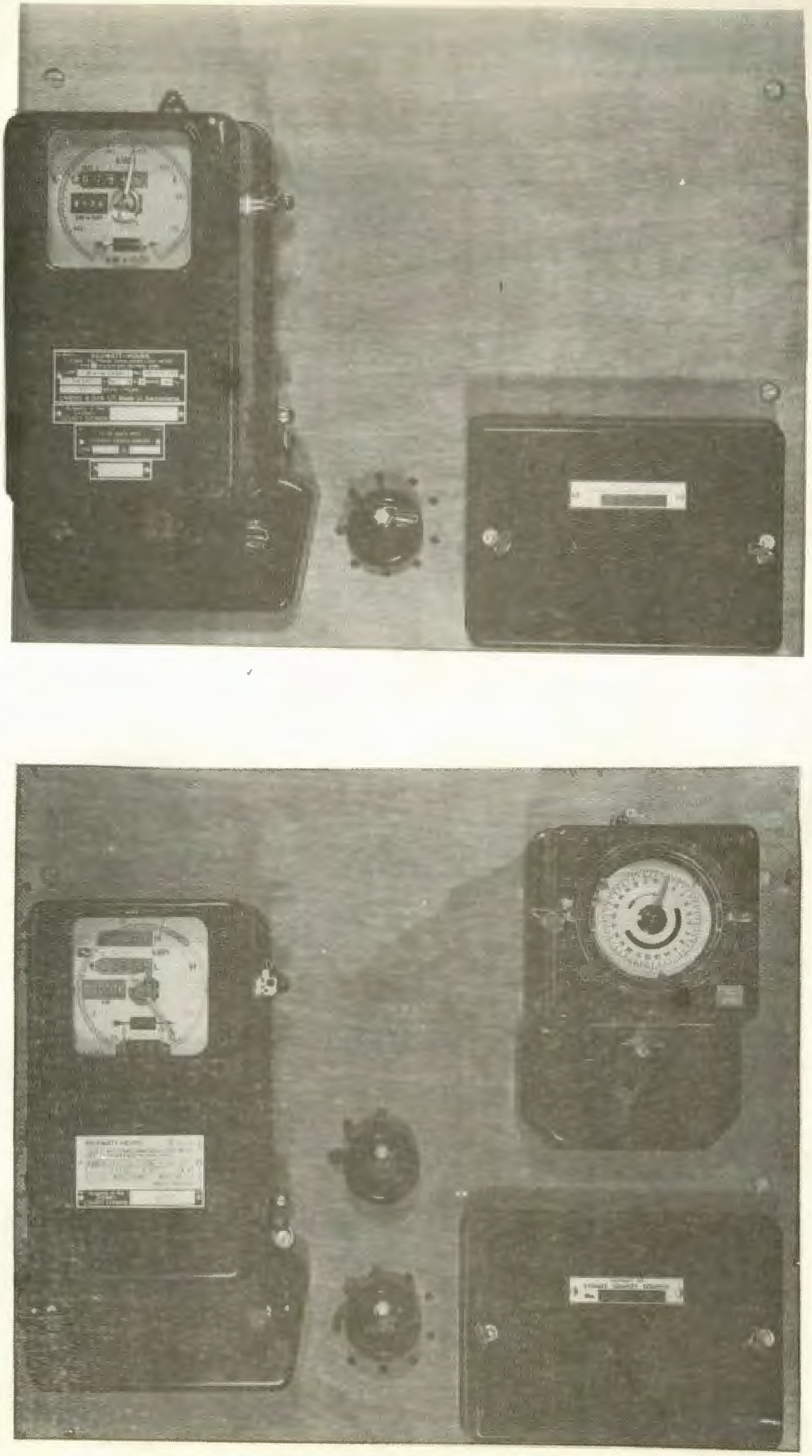
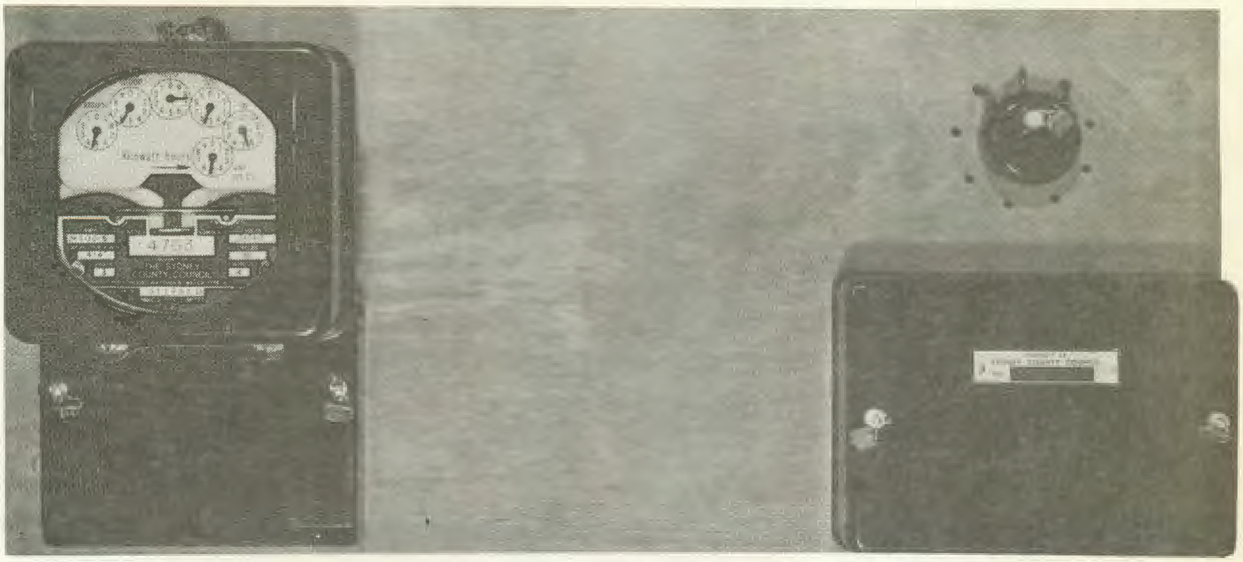


FIGURE 2.

STANDARD INSTALLATION OF ENERGY-DEMAND AND TWO RATE ENERGY-DEMAND METERS ON 18" x 21" WIDE BOARD.



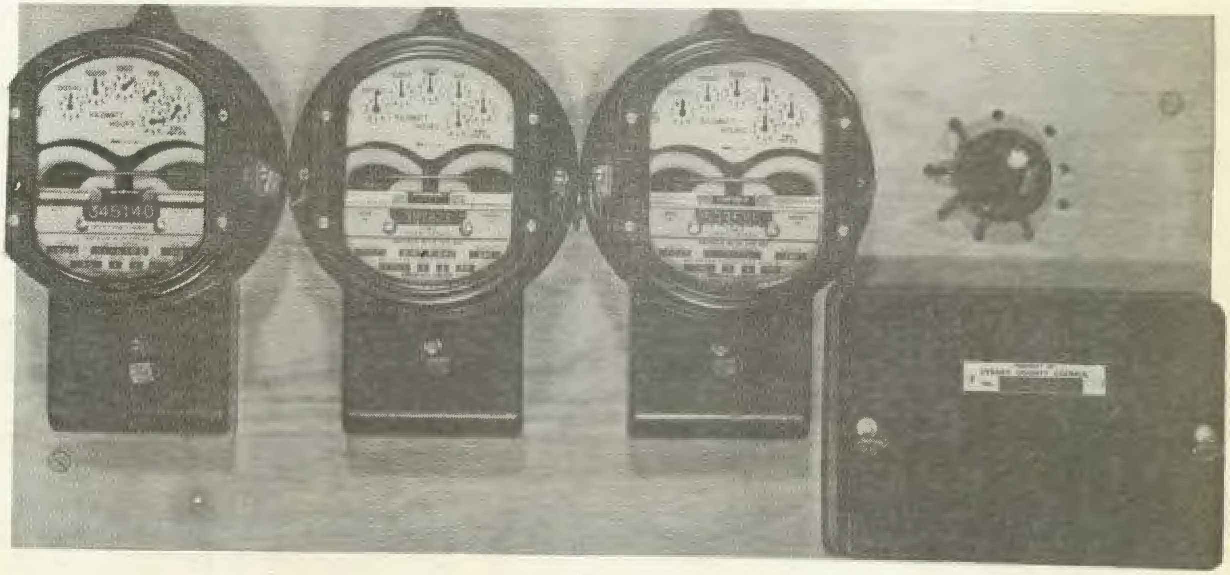


FIGURE 3.

STANDARD INSTALLATION OF POLYPHASE AND SINGLE PHASE METERS ON 12" x 26" WIDE BOARDS. TO BE USED WHERE REQUIRED TO MATCH EXISTING BOARDS ONLY.

COLOUR CODE

All polyphase meters have been tested and adjusted for an anti-clockwise phase sequence, and they must be connected accordingly. The phase sequence is sometimes indicated on the meter register by an arrow, thus ↶ .

To facilitate the identification of cables and connections, a colour code has been devised which must be applied to all new and non standard existing C.T. metering when being installed or worked upon in any way.

The colour code system of identification is as follows.

(a) Identification of Current Transformers

When C.T.'s are installed below the service fuses in the standard manner, the standard red, yellow and blue coloured busbars shall be installed in that order from the left. This system of colouring shall then be used throughout the C.T. wiring as the standard "colour code". See the standard installation in Section 6, figure 2. Where C.T.'s are not installed in the standard manner but are mounted in a logical sequence, they shall be colour marked as "Red", "Yellow" and "Blue" from left to right or from top to bottom irrespective of the colour a customer may have used on his busbars. However, when the C.T.'s are not mounted in a logical sequence any reasonable marking will be satisfactory. The C.T.'s shall be colour marked by wrapping about 3 turns of red, yellow or blue P.V.C. tape around the primary cables or busbars adjacent to the line side of the appropriate C.T. Where more than one set of C.T.'s are installed, the C.T.'s for the main rate shall be colour marked first, and then all C.T.'s connected to similar phases must be marked correspondingly, after tracing the primary conductors visually or with the continuity tester, test lamps etc. This shall apply to all C.T.'s no matter how they may be situated.

(b) Cable Identification

Ten cables having suitable insulation must be installed by the customer between the C.T.'s and the meter in accordance with the Service Rules. In most cases these consist of six 7/.029 secondary current conductors; three 3/.036 potential coil active conductors and one 3/.036 neutral conductor. The neutral conductor, potential coil active conductors and the secondary current circuit conductors shall be identified by passing pieces of 6 mm. plastic tubing of the appropriate colour over each conductor adjacent to the point of connection to the respective terminals. The tubing shall be approximately ½ inch long where only one colour is used, and each piece approximately ¼ inch long where two colours are used.

The colours to be used are as shown in the following table:-

	Red C.T.	Yellow C.T.	Blue C.T.
Secondary current circuit "polarity" conductor.	Red	Yellow	Blue
Secondary current circuit "non polarity" conductor	Red/White	Yellow/White	Blue/White
Potential coil active conductors	Red/Black	Yellow/Black	Blue/Black
Neutral Conductor	Black		

NOTE: See Section ~~15~~ 18, "Two Rate Tariffs" where an additional colour code "red/green" must be used.

The secondary current circuit conductors shall be colour marked at the C.T. secondary terminals, at the line and load sides of the test block and at the meter terminals.

The potential coil active conductors shall be colour marked at the line and load sides of the potential fuses, at the line and load sides of the test block and at the meter terminals.

The neutral conductor shall be colour marked at the point of connection to the main neutral cable, bar or link, at the neutral connector box, at the line side of the test block and at the meter terminal.

NOTE: The potential coil active conductors and the neutral conductor are not connected to the superseded test block to which the secondary current circuit conductors only are connected. When the customer has provided cables in the required colours, the additional colour marking need consist of the one colour, e.g. white and black where required. When only some of the cables are coloured to suit, all cables must be colour marked in the prescribed manner.

The Council will provide cables of appropriate sizes for connection between the test block and meter. Red, yellow and blue cable will be used for the secondary current circuit conductors and for the potential coil active conductors and black cable will be provided for the neutral conductor between the neutral connector box and the meter and test block neutral terminals. Cable of the appropriate colour will also be provided for the board wiring of any time switch or control instrument.

For polyphase metering, the meter wiring for each phase shall be taken from the "red", "yellow" and "blue" C.T's and potential fuses, and it is then treated as red, yellow and blue from left to right at the test block and meter line and load terminals. However, in those cases where supply may be given to the meter potential terminals, the Connecting Officer shall check the phase sequence and if found to be incorrect, he shall interchange the "red" and "blue" potential and secondary conductors at the rear of the meter board. The meter will then be connected "blue", "yellow", "red". Where supply is not available, the phase sequence will be checked and corrected if necessary by the Meter Inspector when making the connection check.

In all cases, sufficient length must be allowed on the "red" and "blue" conductors between the test block and the meter so that the phase sequence of the meter may be corrected at any time.

When single phase meters are installed, the colour marking is done in a similar manner with the "red" and "blue" conductors being connected to the left and right hand meters respectively.

CONNECTION OF CUSTOMER'S MAINS TO C.T's. AND SERVICE FUSES OR OTHER POINTS OF SUPPLY

(See also "Connection and Disconnection of Mains, Meters and Installations", Section 8.)

The following procedure shall be adopted to ensure that installations are correctly connected:-

(1) Carry out the appropriate tests of the supply mains in accordance with Section 8, "Connection and Disconnection of Mains, Meters and Installations" and with B.S.I. No. 459, Index No. 147, issued 1.11.67.

(2) Having properly identified the customer's neutral conductor, connect it to the service neutral link or other point of supply. The customers neutral link must also be now identified as being neutral.

(3) Pass all active conductors through the C.T. or, where the "wound primary" type of C.T. is used, connect the line and load conductors to the respective lugs. The primary, polarity side of all C.T's used by the Council is the line side and is indicated on the C.T. by white or yellow markings. See Section 6, "Polarity of C.T's". Where these cables or C.T's have been installed prior to the Connecting Officer's visit, a check must be made to ensure correctness.

The installation must not be energised unless authority has been given, (see Section 8 "Authority for Connection of Supply after Metering") nor shall it be energised unless the meters are connected to the secondary circuit of the C.T's or the secondary terminals have been bridged. (See Section 6, "Voltage and Current Transformers").

NOTE: Before energising links to which individual customers are to be connected, care must be taken to remove all conductors which are not in use or connected to the line side of a meter.

CONNECTION OF METERS AND METER WIRING

The following procedures shall be adopted in conjunction with the circuit diagrams in Section 25 as applicable, to ensure that meters are correctly connected:-

NOTE: Test block terminals are not generally marked and for identification purposes they shall be referred to as shown in the following outlines.

0	0	0	0	0	0	0	0	0	0
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
0	0	0	0	0	0	0	0	0	0

(a) Test Block currently used to which a neutral conductor, the potential coil active conductors and the secondary current circuit conductors are connected.

0	0	0	0	0	0
1	2	3	4	5	6
7	8	9	10	11	12
0	0	0	0	0	0

(b) Superseded Test Block to which secondary current circuit conductors only are connected.

NOTE: This Test Block must be replaced at every opportunity with the Test Block shown in (a) above.

1. Connection of the Metering Neutral Conductor

The metering neutral conductor, having been traced and colour marked, shall be connected to the main neutral conductor at one end and to a neutral connector box at the other, (see description in Section 1, "Metering Accessories") thence from the neutral connector box to each of the meter and test block terminals. (Test block terminal No. 1). No connection shall be made to the test block neutral load terminal No. 11. A separate neutral conductor must be installed for each set of C.T. metering.

For the designation of meter terminals, see "Alternating Current Meters" in Section 4 and the circuit diagrams in Section 25.

The Council will provide black 3/.036 cable for the connections between the connector box and the meter and test block neutral terminals.

The neutral conductor from the main neutral connection must be connected to one of the main two screw terminals of the connector box, and where more than one connector box is connected in parallel, the extended neutral conductor shall be connected to the same two screw terminal. By this means up to eight instruments may be connected to each connector box.

The neutral box shall be secured to the meter board as shown in figures 1, 2 and 3, or if used in multi board installations it shall be mounted on a fillet strip as shown in figure 2, Section 14.

When the connector box is mounted on a fillet strip, sufficient length of cable must be left on the neutral conductors so the fillet strip may be removed to give access to the wiring at the rear of the meter board.

The connection of the metering neutral conductor to the main neutral conductor shall be made by one of the following methods as applicable:-

(a) At 100/400 amp Service Cabinet

(See description of cabinet in Section 14, "Service Cabinet"). The metering neutral conductor shall be spread and inserted under the main neutral conductor in the clamp type cable lug as shown in figure 9, Section 14. However, where the customer provides a busbar as the main neutral conductor, it must be connected with a solderless lug to the bar by means of a ¼" dia. whit. metal thread screw into a tapped hole provided by the customer, similar to the holes in the standard Council bars. The Council will provide the solderless lug and ¼" dia. screw, washers etc.

In a similar manner to the potential conductors, the neutral conductor shall pass through one of the holes in the metal back of the cabinet, adjacent to the point of connection. Holes of smaller diameter must be drilled through the mounting board centrally with such holes to prevent the conductors touching the metal frame of the cabinet.

In the older type cabinet, back entry holes may not be provided, the neutral conductor must then pass from the cabinet with the main cables or bars through the insulating end pieces and then be taken to the rear of the board through a hole drilled adjacent to the cabinet, in line with the main neutral cable entry.

(b) At 100 amp. and Similar Older Type Service Fuses

The metering neutral conductor shall be spread and inserted under the main neutral conductor in the clamp type cable terminal. In older fuses "sweat up" type lugs were used. In such cases a flag lug (see description Section 1, "Metering Accessories") shall be used and connected under the main load side terminal with the main neutral conductor. In some existing installations the metering neutral conductor may be found sweated in the main lug with the main neutral conductor.

After connection, the metering neutral conductor shall be taken to the rear of the service or C.T. board in a workmanlike manner.

(c) At Locations Other Than Service Positions

The metering neutral conductor shall be connected with a ¼" solderless lug to a ¼" dia. stud provided by the customer. The stud must be equipped with sealing facilites. If due to the close proximity of live metal, there is any danger in sealing this stud, it may be left unsealed.

Where it is not practicable for the customer to provide a stud, the conductor may be connected to any main neutral connection with a flag lug sweated to the conductor.

The Council will provide the ¼"solderless lug or flag lug.

2. Connection of Potential Fuses to Point of Supply

Remembering that the potential fuses are designated "red", "yellow" and "blue" from left to right when mounted horizontally and "red", "yellow" and "blue" from top to bottom when mounted vertically, the 3/.036 cable shall be connected between the red busbar (or cable, service fuse, etc.) and the line side of the "red" potential fuse; the cable adjacent to the fuse being colour marked red/black.

Similarly the conductors shall be connected between the "yellow" busbar and the "yellow" fuse and colour marked yellow/black and between the "blue" busbar the the "blue" fuse and colour marked blue/black.

The line side of the potential fuses shall be connected to the supply by one of the following methods as applicable:-

(a) At Service Cabinet

When the potential fuses are installed adjacent to the cabinet and the standard Council bars are used, the potential conductors shall be connected to the respective bars with a ¼" solderless lug with ½" x ¼" diameter whit. metal thread screw and washer into one of the tapped holes in the bar within the cabinet as shown in figure 2, Section 6. The solderless lug, washers and ¼" screw will be provided by the Council.

Where more than one set of C.T's are installed adjacent to the cabinet, the customer may supply bars as shown in figure 3, Section 6, and the potential conductors must then be connected with a solderless lug to the bars by means of a ¼" diameter whit. metal thread screw into a tapped hole provided by the customer, similar to the holes in the standard bars.

If cables are provided for connection to the service cabinet, the potential conductors shall be spread and inserted under the main cables in the clamp type cable lugs.

In a similar manner to the metering neutral conductor, the potential conductors shall pass through holes in the metal back of the cabinet, adjacent to the point of connection. Holes of a smaller diameter must be drilled through the mounting board centrally with such holes to prevent the conductors touching the metal frame of the cabinet. These conductors shall then pass to their respective fuses through holes drilled in the board supporting the C.T's. In the older type cabinets, back entry holes may not be provided, the potential conductors must then pass from the cabinet with the main cables or bars and to the rear of the board through holes drilled adjacent to the cabinet, in line with the main cable entries.

(b) At 100 Amp. and Similar Older Type Service Fuses

The potential conductors shall be spread and inserted under the main conductors in the clamp type cable terminals. With the older "sweat up" type lugs, flag lugs shall be used and connected to the main load side terminals with the main conductors. In some existing installations the potential conductors may be found sweated in the main lugs with the main conductors. The Council will provide the flag lugs where necessary.

(c) Adjacent to Wound Primary Type C.T's not at the Service Position.

In these locations the potential conductors shall be connected with flag lugs provided by the Council, to the line side primary connection of the transformer.

(d) Adjacent to Ring or Tunnel Type C.T's not at the Service Position

Where busbars are used the potential conductors shall be connected to the bars on the polarity side of the transformer, no connections are permitted in the removable section of the bar. The customer must provide a ¼" diameter stud, or a tapped hole for the insertion of a ¼" diameter whit. metal thread screw. Both must be provided with sealing facilities. The Council will provide the solderless lug required.

If cables pass through the transformers, the connection of the potential conductors shall be made with flag lugs at the necessary joint in the cable required for removal of the C.T. as previously explained in Section 6, "Current Transformers". In this case the joint must be made on the line side of the C.T., or where this is not practicable, the potential conductors may be connected to any other suitable terminal on the line side, on the same switchboard or within the same room.

3. Connections Between Potential Fuses and Test Block and Between Test Block and Meters.

Red, yellow and blue 3/.036" cable will be provided by the Council for the connections between the test block and meters.

(a) Polyphase Meters

The potential cables shall be colour marked at all ends and connected "red", "yellow", "blue" from left to right at the potential fuses, test block and meter terminals. However, in those cases where supply may be given to the meter potential terminals, the Connecting Officer shall check the phase sequence and if found incorrect, he shall interchange the "red"and "blue" secondary and potential conductors at the rear of the meter board. The meter will then be connected "blue", "yellow", "red". Where supply is not available the phase sequence will be checked and corrected if necessary by the Meter Inspector when making the connection check.

In all cases sufficient length must be allowed on the "red" and "blue" conductors so that the phase sequence may be corrected at any time.

METERING INSTRUCTION BOOK
Superseding existing Page 23.

(b) Single Phase Meters

When single phase meters are installed, the colour marking is done in a similar manner with the "red" and "blue" conductors being connected to the left and right hand meters respectively.

(c) Time Switches

In those cases where a time switch is installed in conjunction with a C.T. connected two rate meter, the supply to the time switch motor is usually taken from a link connected in the "red" potential conductor. This being the same phase as the meter register circuit which is connected to the switch terminals of the time switch.

At the time of testing C.T. connected metering, the Meter Branch may reverse the phase sequence of the meter resulting in the register circuit being connected to the "blue" phase and causing two phases to be taken to the time switch.

To overcome this, an additional link shall be inserted in the "blue" potential conductor at the time of the original installation of the time switch. This will enable the Meter Branch to transfer the conductor for the motor circuit from the "red" to the "blue" phase and thus retain only one phase within the time switch.

4. Connection of Secondary Current Circuit Conductors Between C.T.'s and Test Block Line Terminals

Where the C.T.'s are installed in the standard manner, a hole must be drilled adjacent to each for the passage of the secondary current circuit conductors from the rear of the board. Short pieces of 10 mm. clear plastic tubing must be used to enclose these between the C.T. secondary terminal cover and the board. See figure 2, Section 6.

The 10 mm. tubing must also be used in other installations to maintain neatness wherever possible.

The conductors shall then be passed through the holes in the meter board at the top (line side) of the test block, one to each hole. Then tracing each conductor in turn, they must be colour marked at both ends and connected between the appropriate C.T. secondary terminal and test block line terminal.

The Council will provide the $\frac{1}{4}$" solderless lugs necessary for the connection of the secondary conductors to the C.T. secondary terminals.

WHEN MULTI-RANGE C.T's ARE BEING INSTALLED, CARE MUST BE TAKEN TO ENSURE THAT THE SECONDARY CURRENT CIRCUIT CONDUCTORS ARE CONNECTED TO THE CORRECT TAPPINGS.

When meters have a reading constant of 1, they must be connected to the tapping which corresponds to the ratio shown on the meter name plate, e.g. 150/5, 300/5 etc. See Section 2 "Reading Constant".

When meters have a reading constant other than 1, they must be connected to the tapping which corresponds to the product of the constant (shown on the meter) and the C.T. secondary current. The secondary current of all low voltage metering C.T's is 5 amps. e.g. A meter with a constant of 60 must be connected to the tapping equal to 60 x 5 = 300/5.

The following table shows the C.T. tappings for the connection of meters of various constants:-

Meter Constant	C.T. Tapping	Meter Constant	C.T. Tapping
20	100/5	160	800/5
30	150/5	200	1000/5
40	200/5	240	1200/5
60	300/5	300	1500/5
80	400/5	400	2000/5
100	500/5	500	2500/5
120	600/5	600	3000/5

5. Connection of Secondary Current Circuit Conductors Between Test Block Load Terminals and Meters

Red, Yellow and Blue cable of the appropriate size will be provided by the Council for connection between the test block load terminals and the meter terminals. There is no need to colour mark these cables other than with white for the non-polarity connections at both ends.

(a) Polyphase Meter

The secondary cables shall be colour marked and connected "red, "yellow", "blue" from left to right at the test block load terminals and meter terminals. However, in those cases, where supply may be given to the meter potential terminals, the Connecting Officer shall check the phase sequence and if found incorrect, he shall interchange the "red" and "blue" potential and secondary conductors at the rear of the meter board. The meter will then be connected "blue", "yellow", "red". Where supply is not available, the phase sequence will be checked and corrected if necessary by the Meter Inspector when making the connection check.

In all cases sufficient length must be allowed on the "red" and "blue" conductors so that the phase sequence may be corrected at any time.

(b) Single Phase Meters.

Where single phase meters are installed, the connections shall be made in a similar manner with the "red" and "blue" conductors being connected to the left and right hand meters respectively.

6. Connection of Maximum Demand Indicators. (See description of "Maximum Demand Indicators" in Section 5)

If a maximum demand indicator is to be connected in series with each element of a polyphase meter or with each meter where single phase meters are installed, they must be connected in the respective red/white, yellow/white and blue/white conductors between the meter and test block terminals as shown in Section 25, circuit diagrams 8, and 9.

7. Final Operation, Supply Available.

(a) Check the test block and C.T. terminals to be sure that any bridging pieces which may have been used have been removed.

(b) Insert the potential fuses and ensure that the meter potential terminals are energised.

(c) Replace all covers, fix labels where necessary and seal. See Section 13, "Sealing and Labelling".

(d) If the installation may be connected and sufficient load is available, check the meter discs for correct rotation. Check also that the supply is correct at the customer's main switch board. (See "Authority for Connection of Supply after Metering", Section 8).

(e) Leave all test cards for the job wired in with one of the seals on the test block where they will be available for the Meter Inspector on his arrival. All other papers, including the I. 126 form marked "complete", must be returned in the usual manner.

See also Section 12, "Recording Details of Meters Fixed, removed etc."

METERING COMPLETE, SUPPLY NOT AVAILABLE

When supply is not available to check the meter potential terminals and the meter disc rotation, no further action is necessary as every C.T. metering installation will be checked within a few days of completion by the Meter Branch.

Similarly, when due to the same circumstances, the Customer's main switch cannot be checked for correct connections, no further action is necessary as the Installation Inspector will do so at the time of inspection.

Metering will be classed as "complete" in these cases and the I. 126 form shall be marked accordingly. The letters "H.N.C." shall be written on the run sheet against the meter entries in all instances where the metering is complete but the installation is not connected.

METERING IN PROGRESS

When large metering installations cannot be completed in one day, they shall not be treated as "incomplete" but as metering "in progress", providing the following items are adhered to:-

(a) The time between the issue of meters and the completion of the job must not exceed 5 working days.

(b) The words "in progress" must be written against the name and address of the customer concerned on each day's run sheet until completion of the job.

(c) The numbers and types of instruments must be written on the run sheet on the day of their issue, e.g. 3 x 150, 300, 600/5 C.T's one SD, 300/5 meter.

(d) Meter test cards must remain attached to all instruments until they are about to be completed on the final day.

(e) On the final day, all entries must be completed on the run sheet and meter test cards.

METERING INCOMPLETE DUE TO DEFECTS

(a) Ready for Test Certificate Received. (A R.F.T. shall be deemed as having been received unless the statement "Not R.F.T." is stamped across the bottom of the I. 126 form).

If, because of defects, the metering cannot be completed, the Connecting Officer shall mark the original I. 126 form "imcomplete" and make out an additional I. 126 form briefly stating the state of the job, e.g. "Metering complete except for the connection of potential conductors - studs not provided in customer's busbars".

This new form shall be attached to the front of the original and forwarded to the Leading Hand as "imcomplete work", in front of the run sheet with the day's run.

Where meters have been hung in position but not completely wired, the letters "H.N.W." (hung not wired) shall be written on the run sheet against the meter entries.

The Foreman or Leading Hand shall be notified of all cases of incomplete metering where the R.F.T. has been received immediately the Connecting Officer returns to the office. The Foreman or Leading Hand must then inform the Installation Inspector so that he may take appropriate action.

The new I. 126 form shall remain attached to the original and returned to the Planning Clerk who may then relate it to the defect sheet dealing with the incomplete work.

(b) Ready for Test Certificate Not Received.

C.T. Metering is quite often installed prior to the R.F.T. certificate being received. In these cases, before issuing the I. 126 form for the job, the Leading Hand must be satisfied that an application for supply has been received. He shall then stamp across the bottom of the form the words "Not R.F.T.".

If, because of defects, the metering cannot be completed, the Connecting Officer shall make out a new I. 126 form and follow the procedure in (a) above.

However, in all cases where meters are recorded on the run sheet, the additional I. 126 form must be made in duplicate.

These new forms shall be attached to the front of the original I. 126 form and forwarded to the Leading Hand as "incomplete work" in front of the run sheet with the day's run.

Where the new I. 126 form has been made in duplicate, the Leading Hand shall stamp one of them "Not R.F.T." and return it with the run to the Planning Clerk who will attach it to the existing I. 118 form already held.

The original form with the other additional I. 126 form attached to the front shall be held pending further notification from the electrician or customer, or receipt of the I. 118 and I. 126 forms from the Planning Clerk.

When the R.F.T. has been received and the job is issued to complete, the Leading Hand must cross out the words "Not R.F.T.".

The Connecting Officer shall then treat the job in accordance with the procedure laid down in this section as applicable.

NOTE: When completing metering which was previously "H.N.W." the Connecting Officer shall show all meters as being fixed on the run sheet and add the words "previously fixed".

SECTION 13

SEALING AND LABELLING

Sealing of Council's Equipment and Consumers' Equipment Involving Unmetered Supply. Page 1

Labelling

Meters, Time Switches, M.D.I's. etc. Page 3
Current Transformers and Potential Fuses Page 3
Phase Sequence Stickers Page 3
Unmetered Links and Switchgear Page 4

SECTION 12

FORMS, CARDS AND DOCUMENTS RELATED TO METERING AND METHODS OF ORDERING AND RECORDING THE MOVEMENTS OF METERS

CLAUSE NO.		PAGE NO.
1.	Introduction	1
2.	Metering Request Form	2
3.	No Admission Card	4
4.	Requisition of Meters	5
5.	Issue of Meters	6
6.	Area and Branch Codes	7
7.	Tariff symbols	8
8.	Meter and Relay Identity and Coding	9
9.	Metering Record Sheet	11
10.	Relays and Time Switches - Recording of Channel or Time Settings	14
11.	Metering Complete but not Connected (Hung not Connected)	15
12.	Record of Miscellaneous Work	16
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14.	Return of Disconnected Meters	20
15.	Meters Issued but not Fixed	20
16.	Damaged Meters	22
17.	Defective Meters	23
18.	Meters Removed by Mains Section	25

1. INTRODUCTION

Meters and all associated instruments are Council assets and as such, a record must be kept of their movement and condition.

In addition, full details of instruments installed or removed together with the name and address of the customer to whose installation they have been connected to or disconnected from, must be forwarded to the Customers' Accounts Branch so that accounts for electricity consumption may be rendered.

Work to be performed by a metering officer will be covered by one of the following documents:-

Metering Request Form

Accounts Branch Memorandum

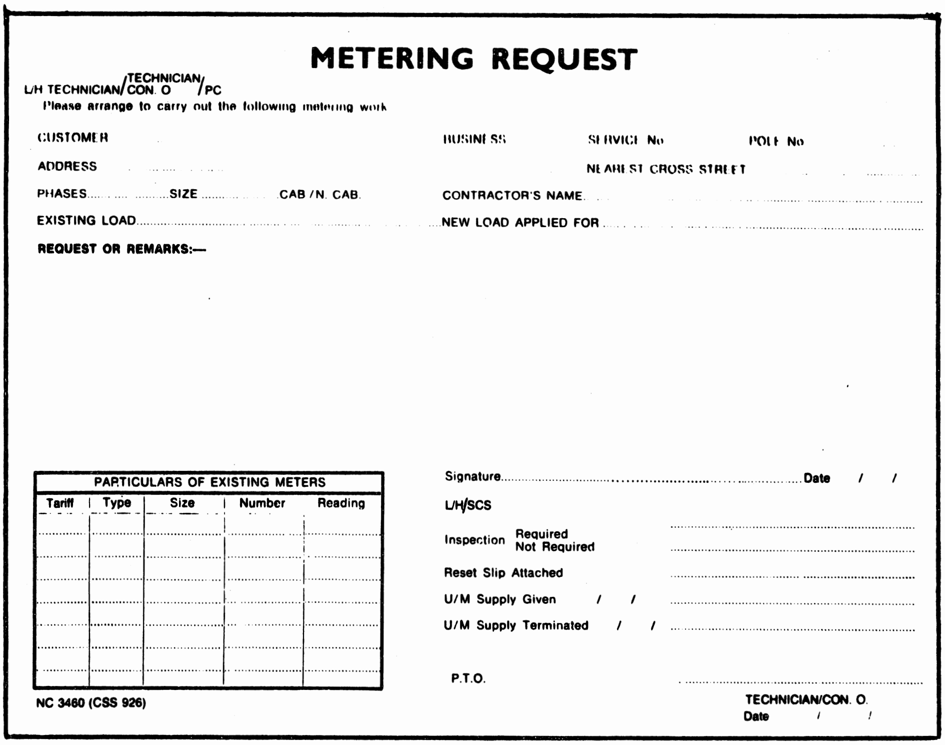
Meter Change Record Form, produced by computer

Emergency Service Officer's report

Memorandum from another officer

This Section of the Metering Instruction Book covers the forms and cards which must be used, together with the reports which must be made to record the movement, connection, disconnection and condition of metering instruments.

2. METERING REQUEST FORM (CSS 926)



METERING REQUEST

L/H TECHNICIAN/TECHNICIAN/CON. O /PC
Please arrange to carry out the following metering work

CUSTOMER
BUSINESS
SERVICE No
POLE No
ADDRESS
NEAREST CROSS STREET
PHASES.................SIZE.................CAB /N. CAB.
CONTRACTOR'S NAME.................................
EXISTING LOAD.................................
NEW LOAD APPLIED FOR.................................

REQUEST OR REMARKS:—

PARTICULARS OF EXISTING METERS

Tariff	Type	Size	Number	Reading

Signature.................................Date / /
L/H/SCS
Inspection Required ....
Not Required ....
Reset Slip Attached ....
U/M Supply Given / / ....
U/M Supply Terminated / / ....

P.T.O. ....
TECHNICIAN/CON. O.
Date / /

NC 3460 (CSS 926)

This form is designed to give all the particulars of new and existing installations to enable metering work to be carried out efficiently.

Officers compiling these forms shall ensure that all entries are made in the spaces provided and that full details of the work to be done are given in the body of the form. In particular, details of any existing meters must be given in the space provided.

Metering officers must, after completion of the work, mark in the lines provided at the bottom of the form, the word "complete", and place their signatures and the date in the spaces provided.

In addition, other entries, regarding unmetered supply, further inspection required, etc., must be made where necessary. If inspection is required, the metering officer shall make a short statement of the work involved.

When unmetered supply is given or terminated, care must be taken to give the correct dates.

When the work has not been completed, the form shall be marked "incomplete" and a further form CSS 926 made out showing the work necessary to complete. See further details of this procedure in Section 10, "Direct-Connected Metering", and Section 11, "C.T. Metering".

Notification from Inquiry Section

Notification that an application for supply has been received for a job usually comes from the Inquiry Clerk in the form of a "Mains Slip". In most cases, a Service Marker will have investigated the job in relation to the service position, point of attachment, etc., and a Service Marker's sketch, CSS 325 will be attached to the Mains Slip.

Notification may also be received in some cases from an officer of the Customer Supply and Services Engineering Section, where supply is taken direct from a substation. Immediately upon receipt of this notification, the job shall be entered in the "Mains Book" in street index order.

The date of receipt of the job, the customer's name, the action taken and the date of despatch of papers to the Inquiry Clerk shall also be given.

The completion date of the metering shall be shown in red in either of the date columns.

Three copies of the form CSS 926 are made out by the Leading Hand.

NOTE: These forms must not be made out unless an application for supply has been received.

Carbon paper must be inserted between the sheets, the original being made out in the usual manner.

The original form CSS 926 is retained by the Leading Hand and the two copies are sent to the Planning Clerk for the district concerned. The Planning Clerk will file both copies until a "Ready for Test" certificate is received.

A brief statement shall be made on the Mains Slip stating that metering arrangements have been made and details of any work which may affect the previous arrangements shall also be given. The slip shall then be forwarded to the Inquiry Clerk.

When the "Ready for Test" certificate is received, the Planning Clerk will forward one copy of the form CSS 926 to the Leading Hand who will issue to a metering officer, the original form CSS 926 with the Service Marker's sketch attached.

The other copy of form CSS 926 shall be attached to the service card, so that Installation Inspectors may check that all meter requirements have been complied with.

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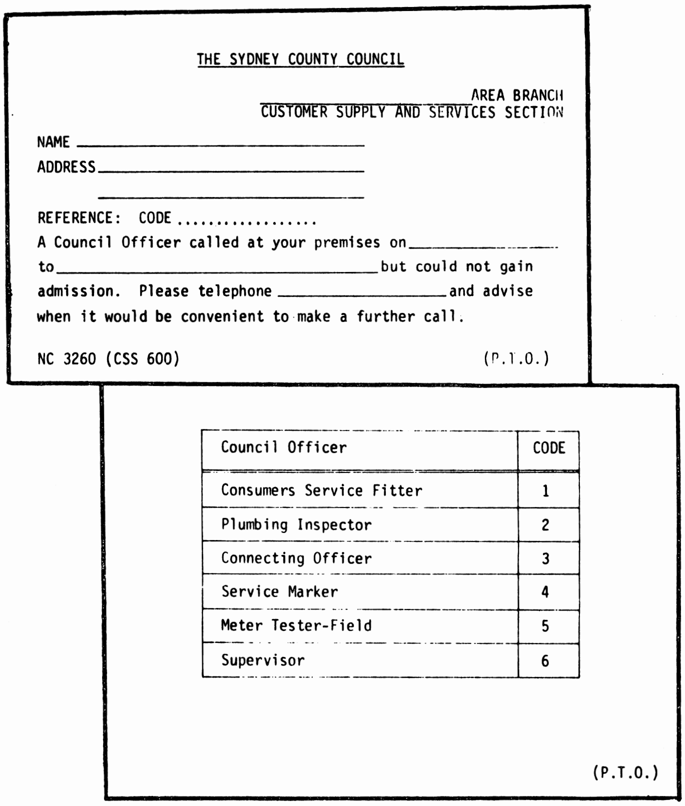
The other copy of form CSS 926 shall be attached to the service card, so that Installation Inspectors may check that all meter requirements have been complied with.

3. NO ADMISSION CARD (CSS 600)



THE SYDNEY COUNTY COUNCIL

AREA BRANCH
CUSTOMER SUPPLY AND SERVICES SECTION

NAME ____________________
ADDRESS ____________________
____

REFERENCE: CODE ....

A Council Officer called at your premises on ____________ to ____________________ but could not gain admission. Please telephone ____________ and advise when it would be convenient to make a further call.

NC 3260 (CSS 600) (P.T.O.)

Council Officer	CODE
Consumers Service Fitter	1
Plumbing Inspector	2
Connecting Officer	3
Service Marker	4
Meter Tester-Field	5
Supervisor	6

(P.T.O.)

When admission cannot be gained to premises to carry out metering work, a "No Admission" card (CSS 600) shall be made out with the appropriate code marking and left in the letter box, under the front door or other place where it will be found by the customer. Metering officers must carry several of these cards at all times.

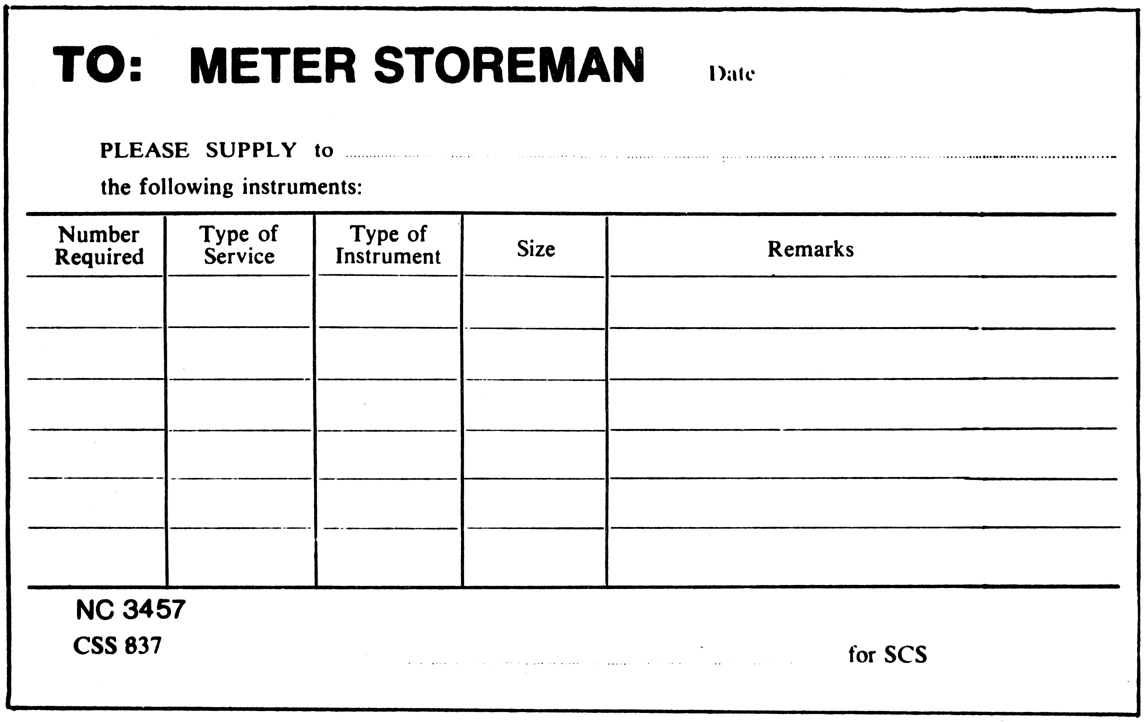
The form CSS 926 or other papers shall be marked "No Admission" (date) ...." and returned to the Leading Hand Technician as incomplete work in front of the run sheet with the day's run.

The Leading Hand shall hold the job for fourteen (14) days and unless admission has been arranged in that time, he shall issue the job again. If access is still not available, the Leading Hand shall forward all papers to the Senior Planning Clerk to arrange for a letter to be written.

The papers will then be returned to the Leading Hand with a copy of the letter, where they shall be held pending admission being gained.

Requests are often made for the removal of meters which have been previously disconnected and therefore, no customer exists. In these cases, the metering officer must gather all information possible regarding the owners or agents of the premises from notices in windows or by making inquiries from adjoining premises so that they may be contacted regarding admission.

4. REQUISITION OF METERS



TO: METER STOREMAN Date

PLEASE SUPPLY to ....

the following instruments:

Number Required	Type of Service	Type of Instrument	Size	Remarks

NC 3457

CSS 837

.... for SCS

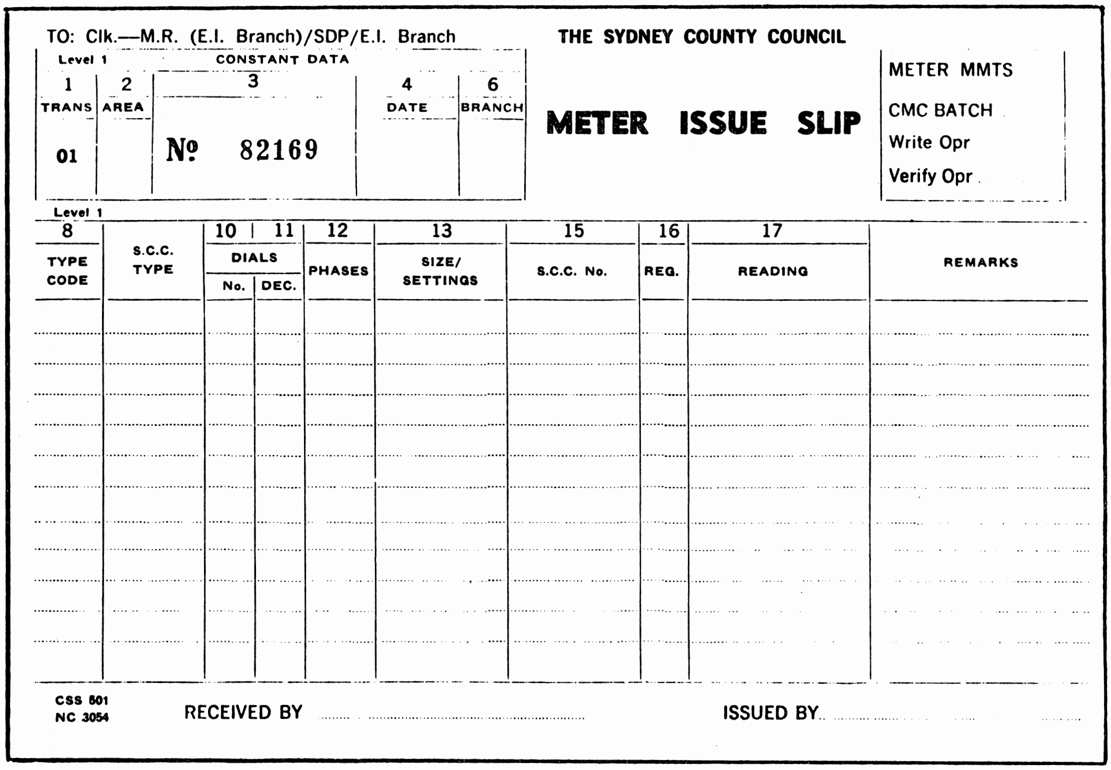
Metering instruments will be issued as required from meter stores situated in the Area Establishments upon presentation of a meter requisition slip (CSS 837).

All instruments must be requisitioned as early as possible on the day prior to issue so that they will be available on the morning of the day required.

Officers making out slips CSS 837 shall ensure that adequate details of the instruments required are given. This applies in particular to time switches or frequency injection relays with special settings, see Section 16, "Off-Peak Tariff", and Section 18, "Night Usage", regarding the special arrangements for the requisition of spring reserve time switches.

When it is known instruments of uncommon size or type, or as set out above, time switches or relays with uncommon settings are required, the officer making out the slips CSS 837 must give ample notice of these requirements to the Meter Storeman.

5. ISSUE OF METERS



TO: Clk.—M.R. (E.I. Branch)/SDP/E.I. Branch

THE SYDNEY COUNTY COUNCIL

METER ISSUE SLIP

Level 1 CONSTANT DATA

1 TRANS	2 AREA	3	4 DATE	6 BRANCH
01		№ 82169		

METER MMTS
CMC BATCH
Write Opr
Verify Opr

Level 1

8 TYPE CODE	S.C.C. TYPE	10 DIALS No.	11 DEC.	12 PHASES	13 SIZE/ SETTINGS	15 S.C.C. No.	16 REG.	17 READING	REMARKS

CSS 501
NC 3054

RECEIVED BY ....

ISSUED BY..............................

All instruments for a particular metering officer's run will be grouped in his name.

The metering officer must check that the instruments issued correspond with the requirements of his day's run also that the total number of each type of instrument agrees with those listed on the "Meter Issue Slip" (CSS 501) which will be presented by the Meter Storeman for his signature.

Any discrepancy between the number of meters issued and those required for the run and/or those listed on the Issue Slip shall be reported to the Leading Hand Technician immediately.

All meters shown on the Issue Slip must be accounted for on the day of issue either as being fixed or returned to store (R.T.S.) if not required.

6. AREA AND BRANCH CODES

ØAREA	CODE
Brisbane Water	1
Bankstown	2
Chatswood	3
Five Dock	4
Hornsby	5
Zetland	6
Mackellar	7
St. George	8
Sutherland	9

ØØBRANCH	CODE
Customer Service	1
Customer Supply	2
Special Metering Programmes	5

Ø Area code identifies the meter store from which metering equipment is issued and returned.

ØØ Branch codes 1 and 2 identify the difference between Technicians in the Meter Test Section and the Installation Section, the former being classified as customer service and the latter customer supply.

Branch code 5 is only used for meters booked out and carried in the Technician's truck for extended periods. These meters must be returned to the Meter Storeman if not used within 28 days.

7. TARIFF SYMBOLS

The symbols used on the Council's documents to indicate the tariff at which a meter has been fixed are set out in the following table. The symbols included in this table must always be used. No others may be used. All letters must be upper case. Full stops, etc. must not be used.

TARIFF	TARIFF SYMBOLS
Current Tariffs	
Domestic	D
Domestic-Multiple Occupancy	DM
Demand-Single-Min.200kW	
High Voltage	DHC
Low Voltage	DLC
Demand-Multiple-Min.200/500kW	
High Voltage	DHM
Low Voltage	DLM
General Supply	G
General Supply-Multiple Occupancy	GM
General Supply-High Voltage	GH
General Supply-High Voltage-Multiple Occupancy	GHM
Institution	I
Institution-Multiple Occupancy	IM
Off-Peak 1	OP1
Off-Peak 2	OP2
Off-Peak 1 (Solar Heating)	OP1S
Off-Peak 2 (Solar Heating)	OP2S
Process Heating	PH
Process Heating-Night Usage	PHNU
Special Supply Agreements	S
Obsolete Tariffs	
Demand-	
High Voltage	DH
Low Voltage	DL
Night-H.V. Supply	NH
Night-L.V. Supply	N
kV.A Demand	KVA
Farm	F
Rural Community Services	RCS
Air Conditioning	AC
Irrigation Pumping	IP
Transferable Night Loading	TNL

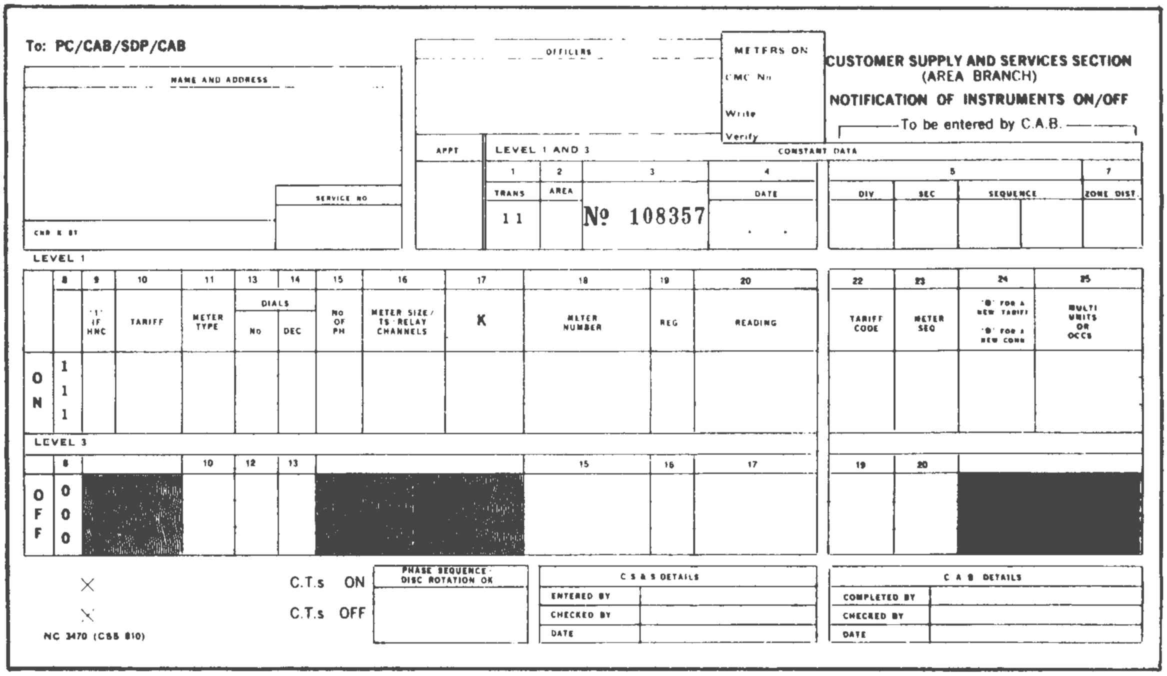
8. METER AND RELAY IDENTITY CODING

CODE	E I B TYPE	MANUFACTURERS' TYPES INCLUDED	MANUFACTURER	NO. OF PH	PURPOSE
A	AZ	AZ	Emmco (early)	1	LV energy
B	BAZ	BAZ	Emmco (early)	1	LV energy
C	CL	CL, CL6f3, LGCL	Landis & Gyr	1	LV energy
	CL2R	CL2R, LGCL2R, CL6df3	Landis & Gyr	1	LV (2R)
D	DC	(All direct current meters)		-	d.c.
E	EMC		Em.(v.early)		LV energy
G	G	S203, S2031, S301, S3012	Sangamo	3	LV energy
		S202, S2021, S300, S3002	Sangamo	2	LV energy
H	HMT	HMT, HM	Sang.(early)	1	LV energy
J	-	Mackellar Area meters not otherwise listed.	Various	-	-
L	LG2R	MG1d, MG1df3, LGMG2R, MG2R,	Landis & Gyr	3	" (2R)
		LGML2R, ML2R, ML12df, ML3d			" "
	LGML	LGML2R, conv. to single rate	Landis & Gyr	3	LV energy
M	M1	M1	Email	1	LV energy
	M2	M2	Email	1	LV energy
N	NLG	LGED, LGMLED	Landis & Gyr	3	Dem.(1R)
		Converted LGED2R & LGMLED2R			
	NW	D2A-3M (LV), D4A-2M (HV)	Westinghouse	3	" "
	NG	VM-64A (LV), VM-63A (HV)	Gen.Electric	3	" "
	N2RLG	LGED2R, LGMLED2R	Landis & Gyr	3	Dem.(2R)
	NSLG	LGDS	Landis & Gyr	3	Dem.Summ.
	NSG	GEDS	Gen.Electric	3	" "
	NPLG	(1R) LGP (FF34hr6 (HV)	Landis & Gyr	3	Pulsing
	N2RPLG	(2R) LG2RP	Landis & Gyr	3	Pulsing
	NPG	GEP	Gen.Electric	3	Pulsing
	NPS	SDM	Email	3	Pulsing
P	PLUG-IN	M1-S	Email	1	LV energy
R	ZEQ22/1		Zellweger	1	Stored
	ZE22/2			2	Heat
	ZE22/3			3	Control
	ATM				
	ACR				
	ACR-SS				
	RE-1		Zellweger	1	
S	SD	SD (non-magnetic)	Email	3	LV energy
	SDM	SDM (magnetic)	Email	3	LV energy
T	LGKYA		Landis & Gyr	1	
	LGKYB		Landis & Gyr	2	
	LG2RD		Landis & Gyr	1	
	WF11		War.Franki	1	
	WF11		War.Franki		
	ODO				
	WF11E2		War.Franki	1	
	WF12		War.Franki	1	
V	VSD	SD, SDM	Email	3	HV energy
	VLG	(1R)	Landis & Gyr	3	HV energy
	V2RLG	(2R)	Landis & Gyr	3	HV (2R)
	VA3	Demand Indicator			HV demand
	VR	Demand Recorder			HV demand

(Continued from Page 9)

CODE	E I B TYPE	MANUFACTURERS' TYPES INCLUDED	MANUFACTURER	NO. OF PH.	PURPOSE
W	WF2		War.Franki	1	LV energy
	WF3		War.Franki	1	LV energy
	WF3s		War.Franki	1	LV energy
	WF3t		War.Franki	1	LV energy
X	XB	Balmain meters			LV energy
Y	YL5	YL5F3, YL5f3	Landis & Gyr.	3	LV energy
		YVL55	Landis & Gyr.	2	LV energy
	YL5D	YVL5d (2R)	Landis & Gyr.	3	LV energy
Z	ZB	Bankstown Meters			LV energy
	ZH	Hornsby Meters			LV energy
	ZS	Sutherland Meters			LV energy

9. METERING RECORD SHEET (CSS 810)



To: PC/CAB/SDP/CAB

CUSTOMER SUPPLY AND SERVICES SECTION
(AREA BRANCH)

NOTIFICATION OF INSTRUMENTS ON/OFF

To be entered by C.A.B.

NAME AND ADDRESS

CNR K ST

SERVICE NO

OFFICERS

METERS ON
CMC No
Write
Verify

APPT

LEVEL 1 AND 3 — CONSTANT DATA

1	2	3	4	5				7
TRANS	AREA		DATE	DIV	SEC	SEQUENCE		ZONE DIST.
11		№ 108357	. .					

LEVEL 1

	8	9	10	11	13	14	15	16	17	18	19	20	22	23	24	25
		'1' IF HNC	TARIFF	METER TYPE	DIALS No	DIALS DEC	No OF PH	METER SIZE/ TS RELAY CHANNELS	K	METER NUMBER	REG	READING	TARIFF CODE	METER SEQ	'0' FOR A NEW TARIFF '0' FOR A NEW CONN	MULTI UNITS OR OCCS
ON	1 1 1															

LEVEL 3

	8		10	12	13		15	16	17	19	20	
OFF	0 0 0	■				■						■

× C.T.s ON

× C.T.s OFF

NC 3470 (CSS 810)

PHASE SEQUENCE · DISC ROTATION OK

C S & S DETAILS	
ENTERED BY	
CHECKED BY	
DATE	

C A B DETAILS	
COMPLETED BY	
CHECKED BY	
DATE	

9.1 Each sheet provides for three instruments ON and/or OFF. If more than one run sheet is required either for more than one premises, (e.g. a block of flats) or more than three instruments, the officer preparing the run shall attach the required number to the back of the first sheet, for completion by the metering officer.

9.2 Owing to the effect of sunlight on the chemically treated paper, sheets must be protected at all times when not in use.

9.3 Backing boards must be used between sets of sheets to prevent entries being transferred to the duplicate of the following set.

9.4 The original sheet is for joint use by the Area Branch and the Customers' Accounts Branch.

9.5 Current transformers are to be recorded by quantity and ratio only, not by S.C.C. serial numbers.

Action by Officers Preparing Runs

9.6 See Clause 9.1.

9.7 The following particulars shall be shown on run sheets:-

(a) Name and address in full.

(b) Corner or nearest cross street, if new premises.

(c) Service number.

(d) The code number of the appropriate Meter Store.

Action by Metering Officers

Installation (ON)

9.8 Enter details under column headings, as below:-

(a) 4 Date

Use numbers for the day/month/year, with two digits for the year in the last space.

(b) 9 HNC

If the meters are hung and wired but not connected, show figure 1. Otherwise leave blank.

(c) 10 Tariff

Show tariff symbol for each instrument, in accordance with symbols set out in Clause 7.

(d) 11 Meter Type

Meters - Use one letter from "Code" column in Clause 8.
Relays - Use R.
Time Switches - Use T.

Repeat for each register of a meter or ON-OFF period of a time switch.

(e) 13 Dials - No.

Relays - Leave blank.
Meters - Show the number of dials to the left of the decimal. Do not enter the decimal point.

(f) 14 Dials - Dec.

Relays - Leave blank.
Meters - Leave blank except for the number of decimal dials on the demand register of an energy-demand meter.

(g) 15 No. of Phases

Relays - Show the number of phases or poles of the instrument.
Time Switches - Show the number of ON-OFF periods.
- For multi-pole or multi-period time switches (not relays) repeat type, S.C.C. Number and Setting on a separate line for each period.

Meters - Show the number on the nameplate. Repeat the number for each register (see (k) below).

(h) 16 Size/Settings/Channels

Relays - Show channels as detailed in Clause 10.
Time Switches - Show settings as detailed in Clause 10. Use a separate line for each period of a multi-period time switch (see (g) above).

Meters - For direct-connected meters show the maximum continuous current, e.g. 80 for a 10/80 meter. For C.T. meters, use 5. Repeat the number for each Register (see (k) below).

(i) 17 Constant (K)

C.T. Meters - Show the K which corresponds with the tappings of the C.T.'s divided by 5, e.g. 150/300/600/5 C.T.'s set at 300A tapping, K = 60.

Direct-Connected - Leave blank.

(j) 18 S.C.C. (Meter) Number

Show the number exactly as it appears on the nameplate of the meter or relay. If the number commences with 0, this is to be inserted. Repeat the number for each register of a meter (see (k) below) or periods of a multi-period time switch (see (g) above).

(k) 19 Register

Relays - Leave blank.
Meters - A line on the run sheet is to be used for each register. Details are to be repeated on each line for tariff, type, etc. (Ditto marks may be used).

Two tariff energy	- H for high tariff. - L for low tariff.
Energy demand	- H for energy. - D for demand.

(l) 20 Reading

Relays - Leave blank.
Meters - Record the full reading but do not show the decimal point in any readings, e.g. show 1356 for a 2.2 demand register, not 13.56. The number of digits in the reading must be equal to the sum of the number of dials recorded in columns 39 and 40. Additional leading zeros are to be used, if necessary.

Removal (OFF)

9.9 As in Clause 9.8(d), (e), (j), (k) and (l).

9.10 If any dials of a damaged meter cannot be read, the symbol "X" must be shown in place of any missing figures, e.g. XXXXX or 18X3X.

General

9.11 Current Transformers ON and OFF shall be shown by the quantity and ratio, e.g. 3 x 150/300/600/5 C.T.'s ON.

9.12 The satisfactory completion of phase sequence and/or disc rotation checks shall be indicated by the officer signing in the space provided.

9.13 Any details set out in Clause 9.7 which have not been provided by the officer preparing the run shall be shown in the appropriate positions.

10. RELAYS AND TIME SWITCHES - RECORDING OF CHANNEL OR TIME SETTINGS

10.1 Clauses 9 and 13 set out general details regarding the recording of relays and time switches on run sheets CSS 810 and CSS 503 or on the specially printed transaction sheets prepared by the computer for bulk instrument changes.

10.2 Detailed below are the methods to be adopted in recording the channels or time settings in Column 16.

Relays - Single Pole

10.3 Show the channel setting, e.g. for channel nine show the figure "9", for channel twelve show "12".

Relays - Multi-Pole

10.4 (a) When the relay controls one meter only use the figures shown on the sticker attached to the relay, i.e. 4 and 6 digits, e.g. 0909 or 121314.

(b) When the relay controls more than one meter (more than one customer) record the relay number separately on each run sheet and show the channel setting for the appropriate customer, e.g. a 3 pole relay issued with a sticker showing 121314 shall be recorded as 12, 13 and 14 as appropriate on the respective run sheet.

N.B. In Column 15 (Phases), the number of poles of the relay must be shown on each run sheet; not the number of phases of the installation.

Time Switches

10.5 Use a 4 digit number for each ON-OFF period of the switch. The first two digits are the ON time and the second are the OFF. If the dial has a 12 hour clock, add 12 to the p.m. figure, e.g. 2307 for ON at 11.00 p.m. and OFF at 7.00 a.m. A separate line of the run sheet must be used for each ON-OFF period involved and the information in the other columns must be repeated. Ditto marks may be used.

10.6 For day omission switches, use the number shown on the card attached to the time switch by the Electrical Installations Branch.

11. METERING COMPLETE BUT NOT CONNECTED

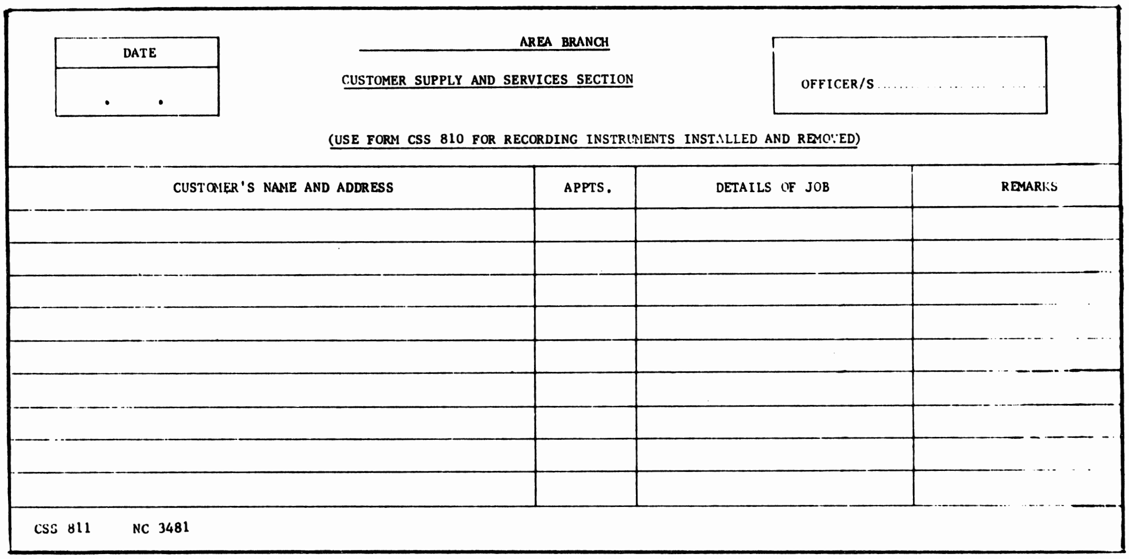
When metering has been completed but the meter load conductors or the service fuses have been "sealed out" (See Section 8, "Authority for Connection After Metering"), all entries shall be made on the run sheet in the usual manner but the figure "1" shall be shown in column 9 headed "HNC".

For further procedure involving incomplete metering see Section 10, "Direct-Connected Metering" and Section 11, "C.T. Metering".

When checking direct-connected polyphase meters where supply was not previously available, the entry "Phase sequence checked" must be shown in the "Remarks" column of the run sheet CSS 811 (See Clause 12) against the name and address of the customer concerned, followed by the initials of the metering officer concerned.

This does not prohibit the erection of meter boards, meter test blocks, etc., prior to the meters being installed. When this procedure is followed, it is recommended that the top meter fixing screws be fixed in position with a meter tag attached to each showing the flat or other numbers so that the electrician may cut his load conductors to suit.

12. RECORD OF MISCELLANEOUS WORK (CSS 811)



DATE
. .

AREA BRANCH

CUSTOMER SUPPLY AND SERVICES SECTION

OFFICER/S ....

(USE FORM CSS 810 FOR RECORDING INSTRUMENTS INSTALLED AND REMOVED)

CUSTOMER'S NAME AND ADDRESS	APPTS.	DETAILS OF JOB	REMARKS

CSS 811 NC 3481

This form is used for duties other than the connection or removal of metering equipment.

Appointment Column

If an appointment has been made, the time shall be entered in this column. Appointments must be kept on all occasions.

The figure "1" in this column indicates that the job against which it appears is one of first priority and must be attended to on that working day without fail.

Details of Job Column

This column will be used by the officer compiling the run sheet to give brief details of the job, e.g. "Loops", "Re-arrange", "Complete Metering", etc.

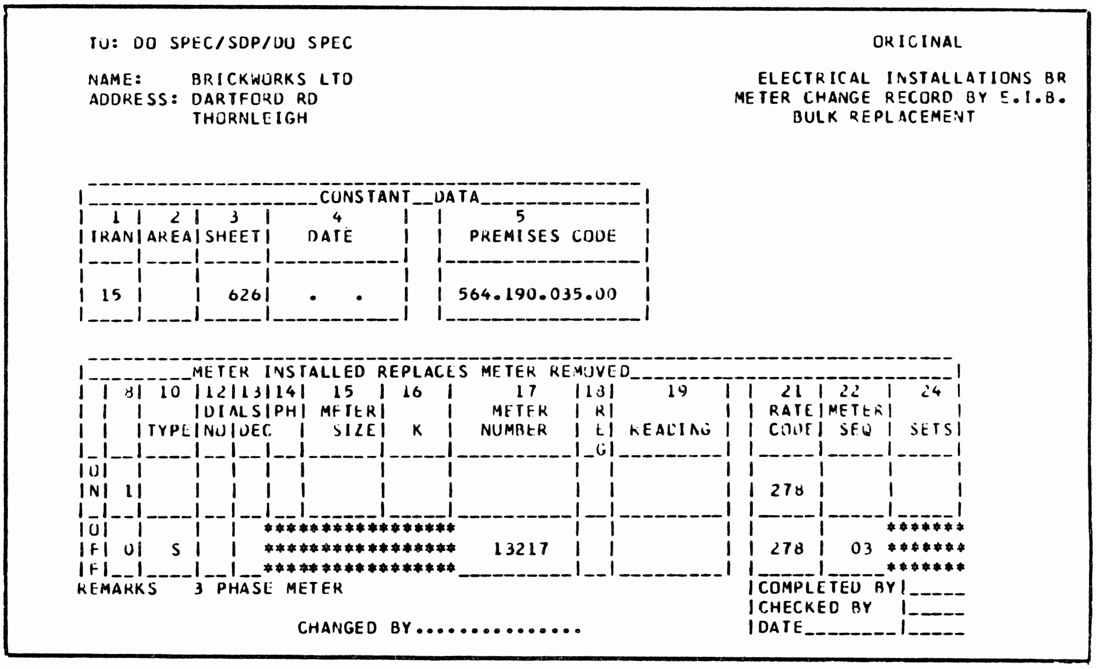
Remarks Column

This column shall be used by the metering officer for special comments such as "CSS 926 to Leading Hand".

13. SPECIAL METERING PROGRAMMES - METER, TIME SWITCH AND RELAY CHANGES

13.1 The following procedures relate to the bulk replacement of meters, time switches and relays. In this sub-section the term "meter" includes time switches and relays.

Meter Change Record



```
TO: DO SPEC/SDP/DO SPEC                                              ORIGINAL

NAME:     BRICKWORKS LTD                                  ELECTRICAL INSTALLATIONS BR
ADDRESS: DARTFORD RD                                     METER CHANGE RECORD BY E.I.B.
          THORNLEIGH                                          BULK REPLACEMENT


 --------------------------------------------------
|____________________CONSTANT__DATA________________|
|  1 |  2 |  3  |     4      |  |        5         |
|TRAN|AREA|SHEET|    DATE    |  |  PREMISES CODE   |
|____|____|_____|____________|  |__________________|
|    |    |     |            |  |                  |
| 15 |    |  626|   .    .   |  | 564.190.035.00   |
|____|____|_____|____________|  |__________________|

 ------------------------------------------------------------------------------------
|_________METER INSTALLED REPLACES METER REMOVED_____________________________________|
| | 8| 10 |12|13|14| 15  | 16 |    17     |18|   19     | | 21 | 22  |  24  |
| |  |    |DIALS|PH|METER|    |   METER   | R|          | |RATE|METER|      |
| |  |TYPE|NO|DEC|  | SIZE|  K |  NUMBER   | E| READING  | |CODE| SEQ |  SETS|
|_|__|____|__|__|__|_____|____|___________|_G|__________| |____|_____|______|
|O|  |    |  |  |  |     |    |           |  |          | |    |     |      |
|N| 1|    |  |  |  |     |    |           |  |          | | 278|     |      |
|_|__|____|__|__|__|_____|____|___________|__|__________| |____|_____|______|
|O|  |    |  |  *****************           |  |          | |    |     *******
|F| O|  S |  |  *****************   13217   |  |          | | 278|  03 *******
|F|__|____|__|__*****************___________|__|__________| |____|_____*******
REMARKS   3 PHASE METER                                      |COMPLETED BY|_____
                                                             |CHECKED BY  |_____
                        CHANGED BY...............            |DATE________|_____
```

13.2 For each meter selected by the Electrical Installations Branch for replacement, the Data Processing Section provides a Meter Change Record form.

13.3 The forms are coloured pink, green or white and are printed serially (original), duplicate, triplicate, next original, etc.) on continuous sheets of paper 254mm x 134mm. They provide details of each customer's name and address, the type and S.C.C. number of the meter to be changed and the Customers' Accounts Branch codes, etc.

13.4 The Leading Hand allocating the day's work shall separate each set of three (3) forms from the continuous sheet, staple the original on top of the duplicate for issue to the metering officer and retain the triplicate.

Action by Metering Officer

13.5 The officer replacing the selected meter shall insert carbon paper between the original and duplicate and shall enter all appropriate details in the numbered spaces in the following manner:-

(a) 2 Area

Show the area code of the Area store from which the new meter was issued. See Clause 6.

(b) 4 Date

Use numbers for the day/month/year, with two digits for the year in the last space.

(c) 10 Type

Use one letter from "code" column in Clause 8.

(d) 12 Dials - No.

Relays and Time Switches - Leave blank.
Meters - Show the number of dials to the left of the decimal.

(e) 13 Dials - Dec.

Leave blank. This column is used only for the number of decimal dials on the demand register of an energy-demand meter.

(f) 14 No. of Phases

Relays - Show the number of phases or poles.
Meters - Show the number of phases appearing on the nameplate.

(g) 15 Meter Size

Relays - Show channels as detailed.
Meters - Show the maximum continuous current, e.g. 80 for a 10/80 meter.

(h) 16 Constant (K)

Leave blank. Used only for C.T. metering.

(i) 17 Meter (S.C.C.) Number

Show the number exactly as it appears on the nameplate.

(j) 18 Register

Leave blank.

(k) 19 Reading

Record the full readings, excluding decimals, of the ON and OFF meters.
If any dials of a damaged meter cannot be read, the symbol "X" must be shown in place of any missing figures, e.g. XXXXX or 18X3X.

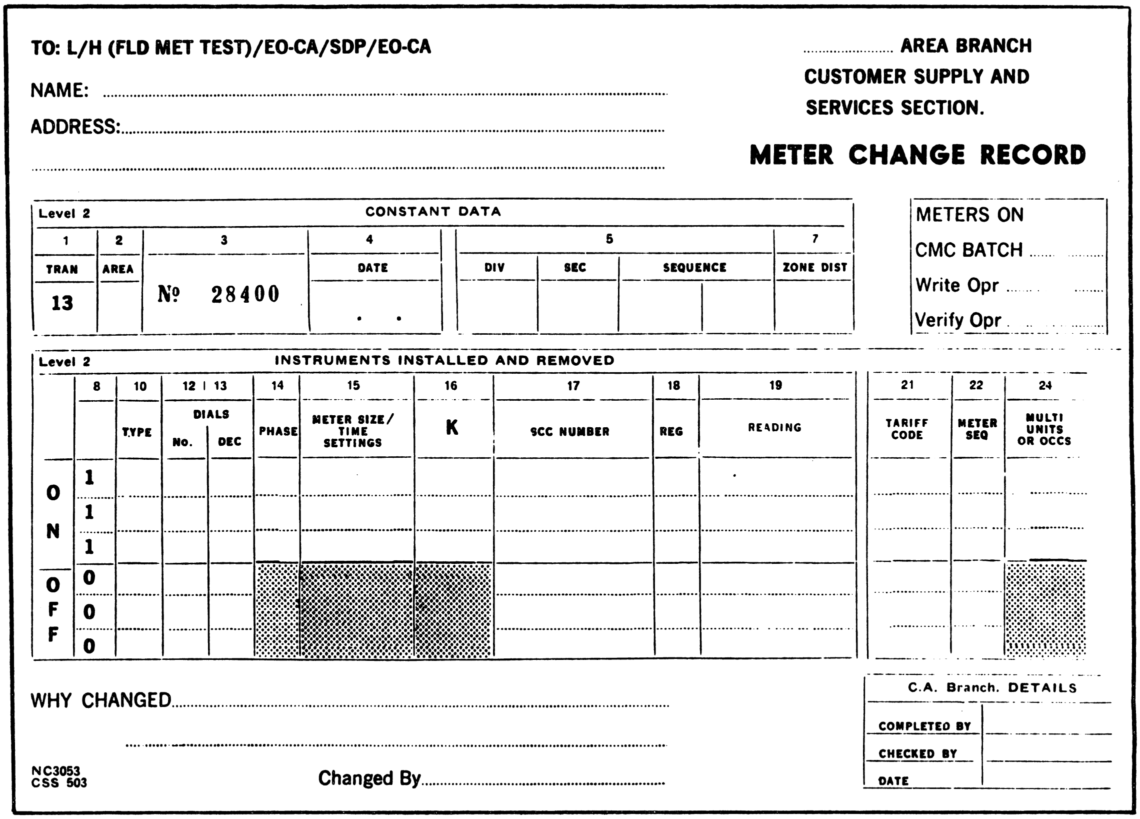
13.6 In "Remarks" section enter any comments, such as "Meter No. ...." defective or damaged.

13.7 Sign where indicated as "Changed by ....".

13.8 On completion of the day's work, hand the original and duplicate to the Meter Storeman with the meter being returned to store.

13.9 If the meter shown to be replaced has already previously been changed, record details of meter found and indicate in Remarks section "Previously changed".

Multiple Changes at Same Premises - Meter Change Record (CSS 503)



TO: L/H (FLD MET TEST)/EO-CA/SDP/EO-CA

NAME: ....

ADDRESS: ....

....

.... **AREA BRANCH**
CUSTOMER SUPPLY AND
SERVICES SECTION.

METER CHANGE RECORD

Level 2 CONSTANT DATA

1	2	3	4	5			7
TRAN	AREA		DATE	DIV	SEC	SEQUENCE	ZONE DIST
13		№ 28400	. .				

METERS ON
CMC BATCH ....
Write Opr ....
Verify Opr ....

Level 2 INSTRUMENTS INSTALLED AND REMOVED

	8	10	12 | 13		14	15	16	17	18	19	21	22	24
		TYPE	DIALS No.	DEC	PHASE	METER SIZE/ TIME SETTINGS	K	SCC NUMBER	REG	READING	TARIFF CODE	METER SEQ	MULTI UNITS OR OCCS
ON	1												
	1												
	1												
OFF	0				▨	▨	▨						▨
	0				▨	▨	▨						▨
	0				▨	▨	▨						▨

WHY CHANGED....................

....

NC3053
CSS 503

Changed By....................

C.A. Branch. DETAILS	
COMPLETED BY	
CHECKED BY	
DATE	

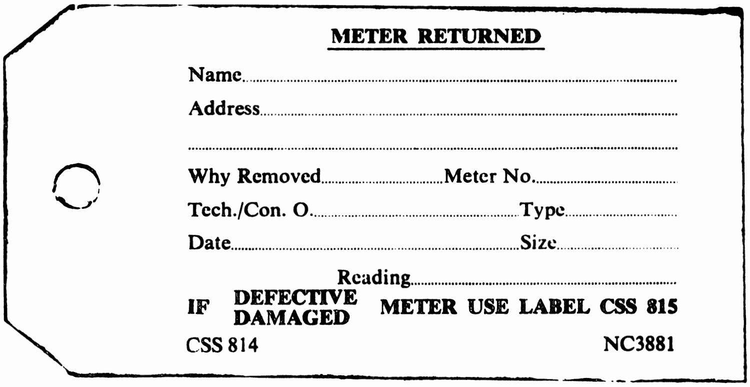
13.10 When a metering officer calls at a premises to change the meter specified on a Meter Change Record form and finds another meter (or meters) of the same type, for which a form has not been issued, he shall change the other meter(s) and record details of the ON and OFF meters on a form CSS 503, "Meter Change Record".

13.11 Forms CSS 503 shall be handled and filled in, in a similar manner to forms CSS 810.

13.12 "Remarks" where applicable, and "Changed by" shall be shown as set out in Clauses 13.6 and 13.7 above.

13.13 As in Clause 13.8, above.

14. RETURN OF DISCONNECTED METERS (CSS 814)



METER RETURNED

Name..

Address..

....

Why Removed.................. Meter No..................

Tech./Con. O.................. Type..................

Date.................. Size..................

Reading..

IF DEFECTIVE DAMAGED METER USE LABEL CSS 815

CSS 814 NC3881

All instruments disconnected and returned in good order, i.e. not damaged or defective, shall have the details shown in the "meters removed" section of the run sheet. They shall also have attached to them a "Meter Returned" label (CSS 814), with details shown in all spaces provided. Examples which may be used in the "why removed" spaces are:-

"Not required", (NR), "Too small", (T.S.), "Type", (T)

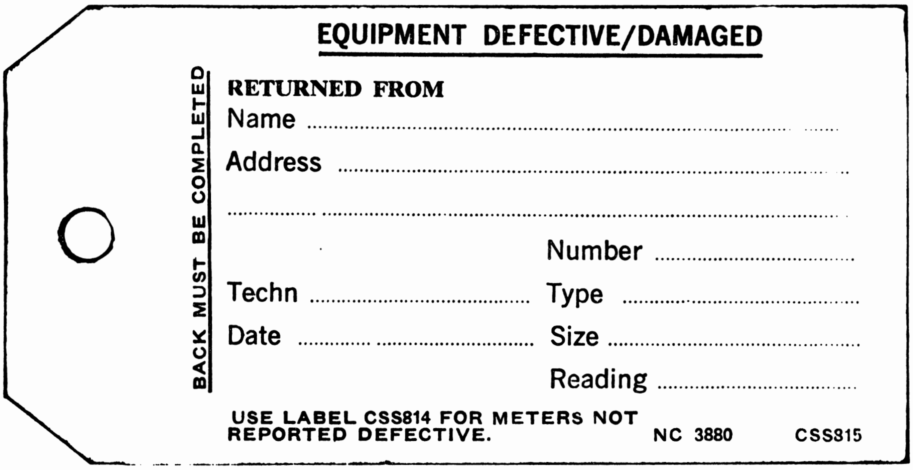
All returned meters must be delivered to the Meter Storeman on that day. The Storeman will check the details of the meter against those shown on the label and the run sheet. However, metering officers working on foot in the City shall leave all disconnected meters in a safe place in the premises from which they were removed. He shall make out a "pick-up" slip, (CSS 969) giving all details of the whereabouts of the meter. The "pick-up" slip must be handed to the Leading Hand Technician who shall check that the number of meters removed corresponds with those to be picked up and shall arrange for their collection.

15. METERS ISSUED BUT NOT FIXED

If a metering officer finds that a meter issued to him is not required, he shall return the meter to the Meter Store. He shall attach a Meter Returned Label, (CSS 814) with the words "Not used" in the address space. The number and reading shall also be given and the label signed and dated. If the "tested" sticker has been removed or interfered with, the meter will be recorded as having been in service and shall be returned with a label CSS 814 attached on return to store. (See Clause 14).

An entry shall not be made on the run sheet (CSS 810).

As the Meter Storeman will accept "not used" meters as being in good order and condition and therefore not requiring testing, particular care must be taken to ensure that if any damage is suspected, the label marked "Meter Reported Defective/Damaged" (CSS 815) is attached. In these cases, in addition to the notation "Not used", the metering officer shall remark on the damage, e.g. "Meter may have been damaged by dropping"; this will indicate that the meter should be returned to the Electrical Installations Branch for checking.



EQUIPMENT DEFECTIVE/DAMAGED

BACK MUST BE COMPLETED

RETURNED FROM

Name ....

Address ....

....

Number ....

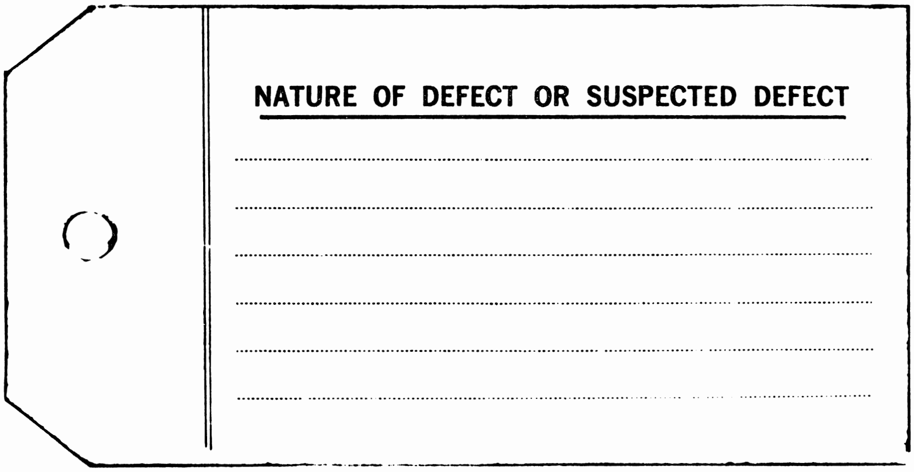
Techn .... Type ....

Date .... Size ....

Reading ....

USE LABEL CSS814 FOR METERS NOT REPORTED DEFECTIVE.

NC 3880 CSS815



NATURE OF DEFECT OR SUSPECTED DEFECT

....

....

....

....

....

....

16. DAMAGED METERS

A damaged instrument is one where a defect or damage is due to external causes.

Meters shall be classified as "damaged" if defects are attributable to any of the following causes:-

Fire.

Defective or inadequate protection from the weather.

Impact or other external causes including vandalism; except when impact has cracked the glass only and has not caused further damage.

Negligence by customer or illegal interference.

Customer's defective installation.

Overload due to any cause.

Damage by Council's staff.

Lightning.

NOTE: If the property plate only of a meter remains, the meter is considered to be damaged.

Reporting of Damaged Meters - General

Officers shall submit a report through the Leading Hand to the Supervisor Customer Supply on a manifold memorandum which should include the following information:-

How and when the damage occurred.

Whether or not the metering position is satisfactory.

Whether or not the investigating officer considers that the damage is likely to occur again.

When meters are damaged owing to the demolition of a building, the name and address of the demolisher should be included in the report.

Reporting of Meters Damaged by Fire

Officers shall submit their report on a form CSS 607, "Fire Investigation Report".

It may be found on these jobs that the Mains Section has removed the meters when removing the service. The metering officer must then call at the Mains Depot, where inquiries shall be made regarding the meters. If located they must then be returned. (See Clause 18).

Where several meters are returned with obvious fire damage, the other adjacent meters shall also be returned if it is thought that they too may be damaged even though there are no visible effects of this.

However, in some instances where it is doubtful whether any meters may be damaged, it may be more economical to leave them as found and request the Customer Services Section to check them on the site. The metering officer shall therefore in these cases make the request through his Leading Hand to the Supervisor Customer Services on a manifold memo.

17. DEFECTIVE METERS

A defective instrument is one where a defect exists in the instrument which is not due to any external cause.

Meters shall be classified as "defective" if the damage is not attributable to any of the causes listed in Clause 16, or is of a minor nature only. Defects which may be considered as minor are set out as follows:-

Defective terminal or terminal screw.

Burnt terminal blocks or terminals caused by loose connections or other reasons.

Meters not functioning after connection.

Creeping or noisy meters.

Internal short circuits, open circuited potential coils or other internal faults.

Minor damage such as a broken glass, broken top fixing lug, cracked terminal cover, etc., except where such damage is caused by Council's staff. (Where the glass is broken and other obvious damage has been caused to the disc, pointers, etc., the meter shall be treated as "damaged").

Meters found to be outside of prescribed accuracy limits.

In these cases the instrument shall be returned to the meter store with a label CSS 815 attached, care being taken to cross out the word "damaged" on the top line. A note must be made on the back of the label giving details of the defect.

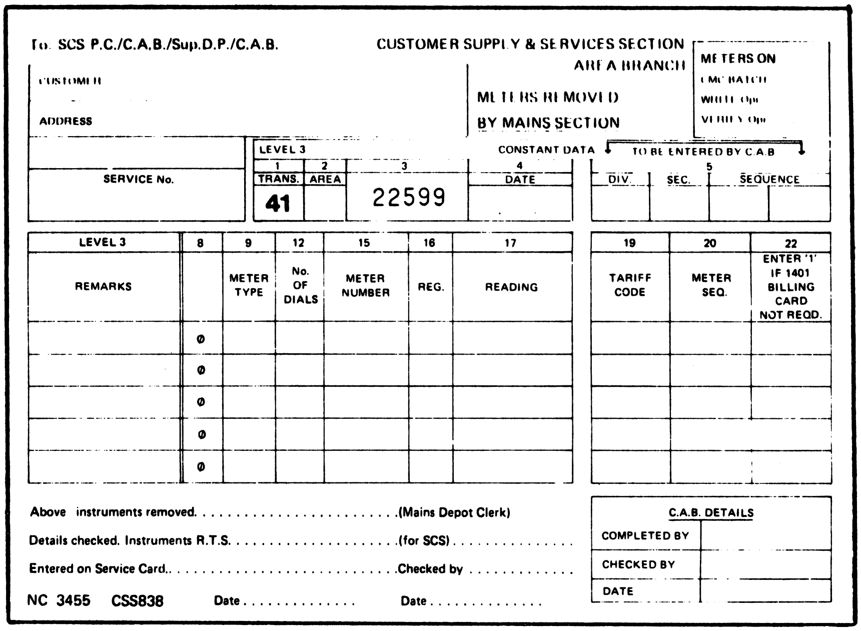
If the meter has been previously connected, details must of course be shown in the "Instruments Removed" section of the run sheet CSS 810.

If the meter is newly issued and has not been connected, the only notation on the run sheet CSS 810 shall be "meter issued defective, CSS 926 L/H for replacement". The metering officer shall also make out a new form CSS 926 requesting the installation of another meter in lieu of that removed. If unmetered supply has been given, it must be noted in the appropriate place at the bottom of the form.

It is sometimes more convenient to leave a defective meter on the job to maintain supply, and if this is done the form CSS 926 shall be made out in a similar manner requesting a replacement meter.

Where existing meters are found defective and the defect may be rectified by a Field Meter Tester on the job, e.g. creeping or noisy meters, etc., a report shall be sent through the Leading Hand to the Supervisor Customer Services, giving details of the meter and the defects.

18. METERS REMOVED BY MAINS SECTION



To: SCS P.C./C.A.B./Sup.D.P./C.A.B.

CUSTOMER SUPPLY & SERVICES SECTION
AREA BRANCH

METERS REMOVED
BY MAINS SECTION

METERS ON
CMC BATCH
WRITE Op
VERIFY Op

CUSTOMER

ADDRESS

LEVEL 3 — CONSTANT DATA — TO BE ENTERED BY C.A.B

	1	2	3	4	5		
SERVICE No.	TRANS.	AREA		DATE	DIV.	SEC.	SEQUENCE
	41		22599				

LEVEL 3	8	9	12	15	16	17	19	20	22
REMARKS		METER TYPE	No. OF DIALS	METER NUMBER	REG.	READING	TARIFF CODE	METER SEQ.	ENTER '1' IF 1401 BILLING CARD NOT REQD.
	0								
	0								
	0								
	0								
	0								

Above instruments removed. . . . .(Mains Depot Clerk)

Details checked. Instruments R.T.S. . . . .(for SCS) . . . .

Entered on Service Card. . . . . .Checked by . . . .

NC 3455 CSS838 Date . . . . Date . . . .

C.A.B. DETAILS	
COMPLETED BY	
CHECKED BY	
DATE	

Meters removed by the Mains Section will be held in the Mains Depot and the Depot Clerk will notify the Leading Hand Technician of the appropriate Customer Supply Section, who shall arrange for them to be picked up.

The metering officer who is required to collect these meters shall ensure that a label CSS 814 or CSS 815 is attached to each meter and that each meter has been properly listed on a form CSS 838 by the Depot Clerk.

He shall deliver all meters to the Meter Store.

The original and duplicate of the form CSS 838 shall be handed to the Leading Hand who shall forward them to the Senior Planning Clerk on the following day. The word "damaged" must be shown in the "Remarks" column against the details of any meter found damaged.

METERING INSTRUCTION BOOK - SECTION 13

Pages 1, 2, 3, 4 and 5 superseding pages 1, 2, 3 and 4, issued June, 1963.

SEALING OF COUNCIL'S AND CUSTOMERS' EQUIPMENT

All equipment, whether the property of the Council or customer, installed on the line side of the Council's metering equipment, and the metering equipment itself, shall be suitably enclosed and sealed to prevent unauthorised interference or use of unmetered electricity supply. In addition, subsidiary meters installed by the Council, paralleling links ("room blocks") and customers' contactors controlled by the Council's time switch, shall be sealed.

Notwithstanding the foregoing there are certain cases where sealing is not insisted upon. Such cases are :-

(a) In certain large installations it is not reasonable to ask for the enclosure and sealing of exposed unmetered busbars, open type switches and fuse gear and panel type switches. In such cases sealing facilities need not be provided if the equipment is located in a switch room or other location accessible only to authorised persons.

However, in any of these cases the Council's metering equipment which includes the metering neutral and potential conductor connections and potential fuses, must be sealed.

(b) Overhead line connector boxes and junction boxes enclosing joints in consumer's mains need not be sealed.

Sealing shall be effected by using sealing pliers to crimp a lead slug or seal on to 22 S.W.G. tinned copper sealing wire in such a manner as to prevent the opening of covers, the exposure of connections or like interference without breaking or removing the seal.

The sealing pliers are fitted with dies which compress the lead seal to form a circular flat surface with the initials of the Branch concerned embossed on one side and a serial number on the other. Pliers issued to the Meter Branch are fitted with dies which crimp the lead into a domed shape. These seals are readily distinguished and are affixed to all meter covers which give access to the mechanism or register. They may also be found fixed to other equipment, but, except for removing a seal that has been interfered with, a Meter Branch seal which seals the cover of a meter mechanism or register shall not be removed by any person other than an authorised Meter Branch officer.

All officers shall make themselves familiar with these requirements and shall report through his supervisor, to the appropriate Assistant Supervisor - Installation Inspections, all cases where equipment required to be sealed is not sealed or where the seals appear to have been interfered with. In cases of interference, the seals shall be carefully removed and returned with the report. All equipment shall be sealed in accordance with this instruction before the officer leaves the premises.

METERING INSTRUCTION BOOK - SECTION 13

Pages 1, 2, 3, 4 and 5 superseding pages 1, 2, 3 and 4, issued June, 1963.

Where seals are broken by a Council officer, they must, in general, be replaced by the officer prior to leaving the premises. Where, for any good reason, the seals are not replaced, the particulars must be reported to the officer's supervisor so that resealing will not be overlooked.

Sealing Methods:

Each piece of equipment must be sealed individually. Firstly for neatness and secondly, in the case of the Council's unearthed metal clad equipment, for safety. However, where a set of all insulated fuses are mounted immediately adjacent to each other, and a suitable groove is provided in the base of each fuse, they may be sealed as one piece of equipment with one piece of sealing wire around all three fuses. When sealing equipment where more than one sealing device is provided, (covers of large sets of links, terminal covers of polyphase meters, etc.) each device must be sealed individually unless due to the design, the sealing wire must pass through at least two devices to adequately seal the equipment, e.g. when wing nuts are drilled for sealing purposes. However, the sealing of a removable panel or hinged door of a switchboard cubicle is acceptable and in some cases is preferable to sealing each individual piece of equipment. When this method is employed it will be necessary to ensure that the customer will not have to call for a Council's officer to unseal the enclosure in order to gain access to his own equipment to which he has right of access.

The method of sealing set out below is the Council's standard method and it will, in general, ensure that sealing is effective and shall be adopted by all officers concerned.

(a) Where the sealing facilities on equipment consist of holes through cases, covers or levers (e.g. SSA4 type time switches) the sealing wire shall be passed through all holes once and tied close to the equipment with a reef knot as shown in figure 1, (A1).

(b) The sealing wire shall be twisted together, passed through one hole in the lead seal and returned through the other as shown in figure 1, (A2).

(c) The length of twisted wire between the knot and the seal shall be kept as short as possible in all cases.

(d) The seal shall be crimped tightly with the sealing pliers to ensure that the wire cannot be withdrawn and that the identification markings of the pliers used are clearly legible.

(e) Any surplus wire projecting from the seal shall be cut off.

(f) The wire with the seal attached shall be doubled back to make the appearance as neat as possible as shown in figure 1, (A3).

In the case of the Hinged Service Board, the sealing strip shall be bent up to cover the head of the securing screw. The sealing wire shall be passed once through the hole in this strip and through the extruded sealing lug on the top of the surround. The sealing wire shall then be tied in a reef knot and the seal affixed as described above.

With meters and metering equipment, where the sealing facilities consist of a hole in a screw or nut and an adjacent hole in a cover, case, post or tag, and with service fuses, the sealing wire shall pass through all holes and the seal may be affixed without the knot being tied providing the length of wire between the seal and the sealing holes is sufficiently short to be completely effective. Figure 1, (B) shows a Meter Branch seal attached to a meter cover in this approved manner and figure 1, (C) shows a seal similarly attached to a service fuse box. Where the seal cannot be fixed close to the sealing holes, as may occur when items of equipment are mounted close together, the sealing wire shall be tied in a reef knot as shown in figure 1, (A1).

Figure 1, (D) shows an approved method of sealing equipment with two fixing posts, such as small boxes containing links or potential fuses for C.T. metering.

Pages 1, 2, 3, 4 and 5 superseding pages 1, 2, 3 and 4, issued June, 1963.

METERING INSTRUCTION BO - SECTION 13

LABELLING.

Meters, Time Switches, M.D.Is. etc.

Meter tags are provided for the identification of meters, time switches, etc., when installed on customer's premises. The tag consists of a white card held in a brass holder suitable for tying to an instrument.

The tag must be tied separately to the instrument with sealing wire in a position where it is unlikely to be removed or interchanged with the tags on other instruments. They must not be attached to terminal covers.

A tag shall be fastened to every M.D.I. and time switch showing the number of the meter connected in series with it on the white card under the words "meter No.". Where an M.D.I. is connected in series with each element of a polyphase meter, the number of the element, either 1, 2 or 3 from the left, shall be shown on the tag in addition to the meter number.

In all other cases, the plain reverse side of the white card shall be used, giving more room for identification particulars.

Where more than one rate is metered at a position involving only one customer, the abbreviations for the various rates shall be shown on the tags. e.g. "G.S.," "Air Con.," etc. Where several meters are connected at the one rate, it is only necessary to tag one meter providing an arrow is shown to indicate all meters connected at that rate.

At multi-customer meter positions, the meters for each customer must be labelled with the room or flat number, or failing this, in the customer's name. In addition, in city buildings or other multi-commercial premises, the service number, including the stroke number, shall be shown. The service number will be shown on the metering request form when it is known or it may be found on an existing tag.

The rate abbreviation need not be shown on tags where space does not permit or where all meters are connected at the one rate. e.g. home units connected at Domestic Rate.

Current Transformers and Potential Fuses.

Where more than one set of C.Ts. or potential fuses are installed, they shall be identified with a tag or label provided by the Council to indicate the rate or customer to which they are connected.

Phase Sequence Stickers. (See "Metering Accessories", Section 1).

A small adhesive sticker showing the anticlockwise phase sequence symbol shall be fixed to the glass face of all whole current polyphase meter cases after all checks as detailed in Section 10, "Whole Current Metering", have been carried out and found correct.

Unmetered Links and Switchgear.

The need for sealing the Council's service and metering equipment and links, etc. mounted on the Council's service or meter boards will be self-evident. To assist in identifying other customer's unmetered links or switchgear, self adhesive labels bearing the letters "U/M" (unmetered) will be attached to that equipment. (See "Metering Accessories", Section 1). Connecting Officers will, therefore, fix these labels at each of the following positions.

1. On the cover of every individually covered unmetered link.
2. On the cover of every set of unmetered links. Where any dimension of such cover exceeds 12 inches, two labels will be affixed, one at each end of the cover adjacent to a sealing device.
3. On the covers of all customer's switchgear required to be sealed (master switch, E.L.C.B., etc.).

The labels shall be attached to all new equipment at the time of connection. When calling at existing installations, Connecting Officers shall fix labels to any of the above equipment which has not already been labelled.

Each Connecting Officer shall ensure that he carries with him, at all times, an adequate supply of the labels to enable this instruction to be observed.

In general, the labels will not be issued to Installation Inspectors but any Inspector who notices unmetered links etc. that are not labelled, will make out a form C.I.I. 126, requesting a Connecting Officer to fix the labels.

Pages 1, 2, 3, 4 and 5 superseding pages 1, 2, 3 and 4, issued June, 1963.

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LABELLING

Meters, Frequency Injection Relays, Time Switches etc.

Meter tags are provided for the identification of metering instruments when installed in customers' premises. The tag consists of a plain white card inserted in a brass holder which is illustrated in Section 1, figure 3.

Meter tags shall be used as follows:-

1. Frequency Injection Relays and Time Switches

   A tag shall be secured to each relay and time switch showing the number of the meter connected in series. These tags are usually tied to the instruments prior to issue. In addition, the identification of the sub-installations connected shall be made on a tag which shall be secured to the meter board in the same manner as for meters in paragraph 2 below. The foregoing is particularly important where more than one separately metered sub-installation is connected to a multi-pole relay.

2. Meters

   A tag shall be secured to the meter board with a wood screw in a position immediately adjacent to the meter so that there can be no doubt as to the meter concerned. The position for the tags will be marked on the 12" x 26" wide boards.

   Where no such location exists, the tag shall be tied separately to the meter with sealing wire in a position where it is unlikely to be removed or interchanged with tags on other instruments. Meter tags shall not be attached to meter terminal covers.

* Where more than one rate is metered at a position involving only one customer, the abbreviations for the various rates shall be shown on the tags. e.g. "G.S.", "P.H.", "O.P." etc. Where several meters are connected at the one rate, it is only necessary to tag one meter providing an arrow is shown to indicate all meters connected at that rate.

At multi-customer meter positions, the meters for each customer must be labelled with the room or flat number, or failing this, in the customer's name. In addition, in city buildings or other multi-commercial premises, the service number, including the stroke number, shall be shown. The service number, will be shown on the metering request form when it is known or it may be found on an existing tag.

The rate abbreviation need not be shown on tags where space does not permit or where all meters are connected at the one rate. e.g, home units connected at Domestic Rate.

Current Transformers and Potential Fuses

Where more than one set of C.T.'s or potential fuses are installed, they shall be identified with a tag or label provided by the Council to indicate the rate or customer to which they are connected.

Phase Sequence Stickers. (See "Metering Accessories", Section 1).

A small adhesive sticker showing the anti-clockwise phase sequence symbol shall be fixed to the glass face of all whole current polyphase meter cases after all checks as detailed in Section 10, "Whole Current Metering", have been carried out and found correct.

Unmetered Links and Switchgear

The need for sealing the Council's service and metering equipment and links, etc. mounted on the Council's service or meter boards will be self-evident. To assist in identifying other customers' unmetered links or switchgear, self-adhesive labels bearing the letters "U/M" (unmetered) will be attached to that equipment. (See "Metering Accessories", Section 1). Connecting Officers will, therefore, fix these labels at each of the following positions:-

1. On the cover of every individually covered unmetered link.
2. On the cover of every set of unmetered links. Where any dimension of such cover exceeds 12 inches, two labels will be affixed, one at each end of the cover adjacent to a sealing device.
3. On the covers of all customers' switchgear required to be sealed (master switch, E.L.C.B., etc.).

The labels shall be attached to all new equipment at the time of connection. When calling at existing installations, Connecting Officers shall fix labels to any of the above equipment which has not already been labelled.

Each Connecting Officer shall ensure that he carries with him, at all times, an adequate supply of the labels to enable this instruction to be observed.

In general, the labels will not be issued to Installation Inspectors but any Inspector who notices unmetered links etc. that are not labelled, will make out a form I.126, requesting a Connecting Officer to fix the labels.

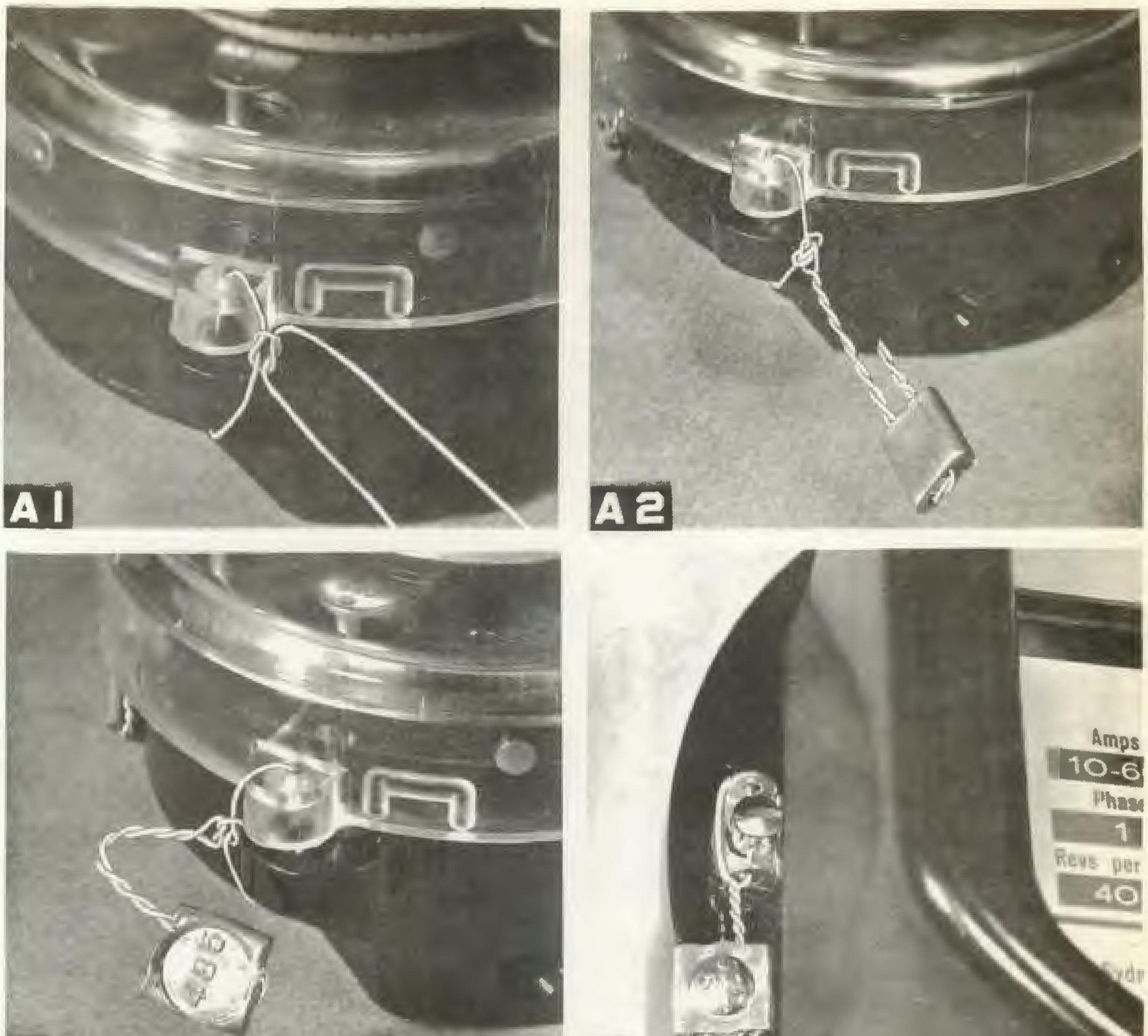

FIGURE 1.
METHOD OF SEALING

(Amndt. No.1, 26-3-64)

Introductory Page, superseding existing page issued June 1963

SECTION 14

SERVICE FUSES

SERVICE AND METER BOARDS

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SERVICE FUSES AND NEUTRAL LINKS

General

Supply is generally made available by the Council through service fuses which are installed in the customer's premises in a position selected by the Mains Branch.

The Council may replace the fuses in some cases with links or a circuit breaker, or where an installation is connected direct to a substation, the mains may be connected direct to the customer's switchboard without the interposition of service fuses or links.

Where service fuses are to be installed in new installations, and in all cases where obsolete service fuses are being replaced, the Mains Branch will install either 70 amp. or 100 amp., service fuses (figure 1) or the 100/400 amp. distribution service fuse cabinet (figures 8 and 9).

The term "50 amp. service" is given to the installation of 70 amp. service fuses because of the size of the service lines which are usually 7/.044.

NOTE: There shall be a service fuse for each active service conductor of supply and a neutral link or bar (figure 1) for the neutral conductor. In certain cases some old installations may be found where there is a fuse in the neutral service conductor. When found, this must be removed and a neutral link installed in its place. (See (a) below).

Replacement

Connecting Officers shall also replace service fuses and links in some circumstances whilst carrying out metering work as follows:-

(a) Where the main neutral is fused it shall be replaced with a link.

(b) Where additional metering is installed, a 55 amp. neutral link must replace the existing neutral bar where such exists, to enable the connection of meter neutral conductors.

(c) Any deteriorated fuse, bar or link.

(d) In some cases where metering alterations are made involving the alteration of position of service fuses.

Connections

Service Spanners must be used on all fuse terminals with hexagonal heads.

Service fuses must in all cases be connected as Neutral, A - B - C phase from left to right when facing the board. In the case of the Domestic Standard Service Board the fuses are in the order A - B - C from left to right when looking down onto the back of the opened board and the neutral link is placed centrally as shown in figure 15. Attention is drawn to the fact that in some existing installations, service fuses may be connected as A - Neutral - B - C from left to right. This is an old arrangement which was discontinued many years ago.

The identification of service fuses in this manner has no relationship to the phase sequence.

The top terminals of all service fuses must be the line side except where supply is from an underground service: in this case the line side is connected to the bottom terminals. Where service fuses are mounted horizontally as on the Hinged Service Board, the left side terminals shall be the line side.

Parallel connections will not be permitted in the terminals of any service fuse or neutral link except as follows:-

(a) Metering neutral and potential conductors may be connected in parallel with the main conductors.

(b) Where an off peak water heater forms an addition to an existing domestic installation, the neutral conductors for each separately metered portion may be connected in parallel.

(c) Two 7 strand conductors may be connected in parallel into the terminals of any 70 amp. service fuse installed on a domestic installation for the purpose of separate metering.

(d) One conductor up size 7/.064 may be connected to each of the busbars used in the standard CT installation with the Service Cabinet (figure 9), or in a similar manner when customer's busbars are connected to the cabinet providing they are drilled and tapped in the same way as the standard bars.

BOARDS

General

Council's metering and service equipment shall be mounted on water proofed plywood boards which are available in standard sizes. The range of boards will accomodate either service fuses, metering instruments or both service fuses and metering instruments.

The board sizes and their particular uses are as shown below, however a Mains Branch or an Inspection Branch Supervisor may designate other uses from time to time.

12" x 26" wide

70 amp. service fuses, figure 4.
100 amp. service fuses, figure 7.
Metering instruments only, figure 2.

20" x 26" wide, Predrilled.

70 amp. service fuses and meters, figure 5.

12" x 18" wide, predrilled.

70 amp. service fuses and meters for use with the Service Surrond, figures 12 to 24.
70 amp. service fuses and polyphase meter, figure 6.

18" x 12" wide.

C.T. meter and test block, figure 1, Section 11.
Existing domestic installations, figure 2, Section 10.

18" x 21" wide.

Service cabinet, figures 2 and 3, Section 6.

21" x 18" wide.

70 amp. service and meters, figure 6A.

12" x 21" wide.

C.T.'s mounted in standard manner under Service Cabinet, figure 2, Section 6.
Metering instruments only where a 21" wide board is required to match the width of the boards shown in figure 5, Section 11.

4" x 26" wide.

Fillet strip for use as an access board between horizontal rows of meter boards and for mounting of neutral connector box, figure 2.

Service Boards.

Where meters are mounted on service boards, they shall be located as described in this Section under the heading of the particular service board.

Mounting of Meters only on the 18" x 21" Wide Board

This board may be used for the mounting of metering equipment which, due to its size, cannot be mounted on any standard 12" high board, e.g. C.T. connected or whole current energy-demand metering. See illustration in Section 11, figure 5.

Mounting of Meters only on the 12" x 26" Wide Board

Where meters only are mounted on the 12" x 26" wide board, they shall be located as shown in figure 2 of this Section. If polyphase and single phase meters are mounted on the same board, the polyphase meters shall be mounted on the extremities as shown.

Time switches, M.D.I's or other instruments may be mounted in the same positions in lieu of meters when required.

A clearance of two inches must be maintained between SD type polyphase meters so that the balance adjustments mounted in the sides are accessible. Single phase meters, except the B.A.Z. two rate single phase meter in a SD type case, may be mounted immediately adjacent to the SD type meter without causing obstruction.

Where three SD type polyphase meters are mounted on the 12" x 26" wide meter board, the spacing shall be as follows:-

> The middle meter must be mounted on the centre line of the board, the left and right meters must then be spaced $1\frac{1}{2}$" from either end. This will ensure adequate clearance if other boards with SD type meters are fixed with the vertical edges abutting. See figure 2 of this Section.

Mounting of Meters on Existing Boards.

Existing boards may be used for mounting of metering equipment. For example, the combination service and customer's board in the Sutherland Shire and Bankstown Municipal areas, and the older type wooden boards of

METERING INSTRUCTION BOOK ECTION 14.
Pages 3, 4 & 5, superseding pages 3, 4 and 5 issued June, 1963.

METERING INSTRUCTION BOOK - SECTION 14.

Pages 3, 4 & 5 superseding pa 3, 4 and 5 issued June, 1963

numerous sizes throughout the whole County area, providing of course the usual requirements of access to motors and wiring are available.

Board of Zelemite or Similar Material.

Metering equipment may, when specific approval has been given, be mounted on a panel of zelemite or like switchboard material.

Access to meter wiring, fixing screws and nuts must be readily accessible from the front of the panel. All necessary holes must be drilled by the customer to the Council's satisfaction, and by the nature of the industry, an assurance must be given that drilling facilities will always be available for any future alterations or additions.

Clearance (See also Service Rule 7)

A clearance of 3" must be maintained on all sides of service and meter boards with the following exceptions:-

(a) Where 12" x 26" wide meter boards are mounted alternately with fillet strips, other meter boards may abut the sides as shown in figure 2 of this Section. The customer's switchboard may also abut the sides of this board providing that if any equipment extends beyond the face of the meter board, a clearance of 2" must be maintained between the sides of the meter board and that equipment.

(b) Where the Hinged Service Board is installed in the Compact Service Box, no clearance is provided at the sides of the board and the customer's switchboard may abut the lower side of the surround without the 2" clearance required in (a) above.

(c) Where the Hinged Service Board is installed in a position other than in the Compact Service Box, the customer's switchboard may abut the lower edge of the surround as in (b) above. The customer's switchboard may also abut the sides of the surround providing that if any equipment extends beyond the face of the closed service board, a clearance of 2" must be maintained between the sides of the surround and that equipment.

(d) The Mains Branch will request 12" clearance at the top and the hinged side of the Service Cabinet, and 3" on the other sides.

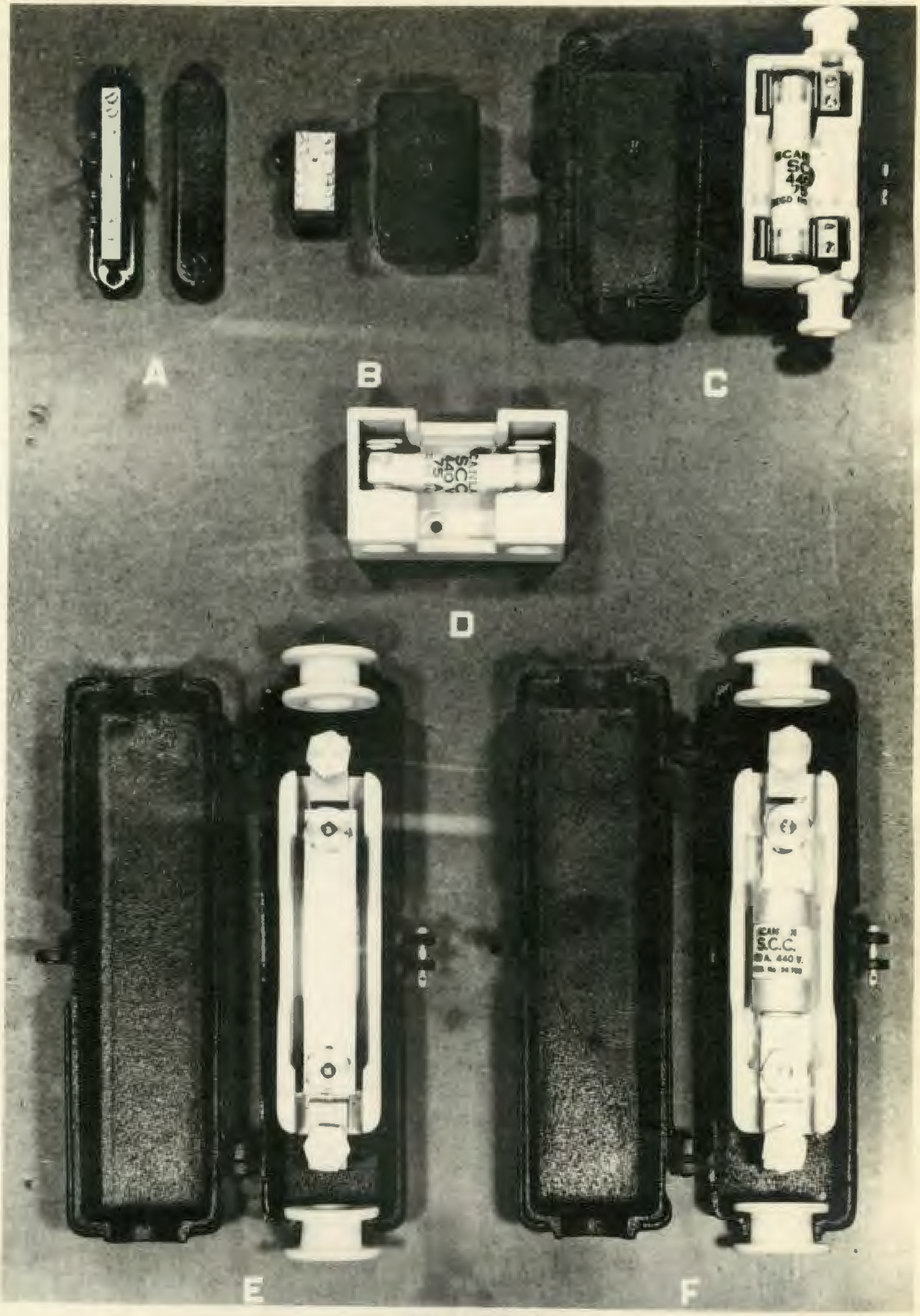

FIGURE I.

A,(OLD TYPE) AND B,(NEW TYPE) NEUTRAL LINKS WHICH MAY BE USED WITH 75 AMP FUSE FOR A 50 AMP SERVICE

C: 75 AMP SERVICE FUSE

D: 75 AMP SERVICE FUSE USED WITH HINGED SERVICE BOARD

E: 100 AMP SERVICE NEUTRAL LINK

F: 100 AMP SERVICE FUSE

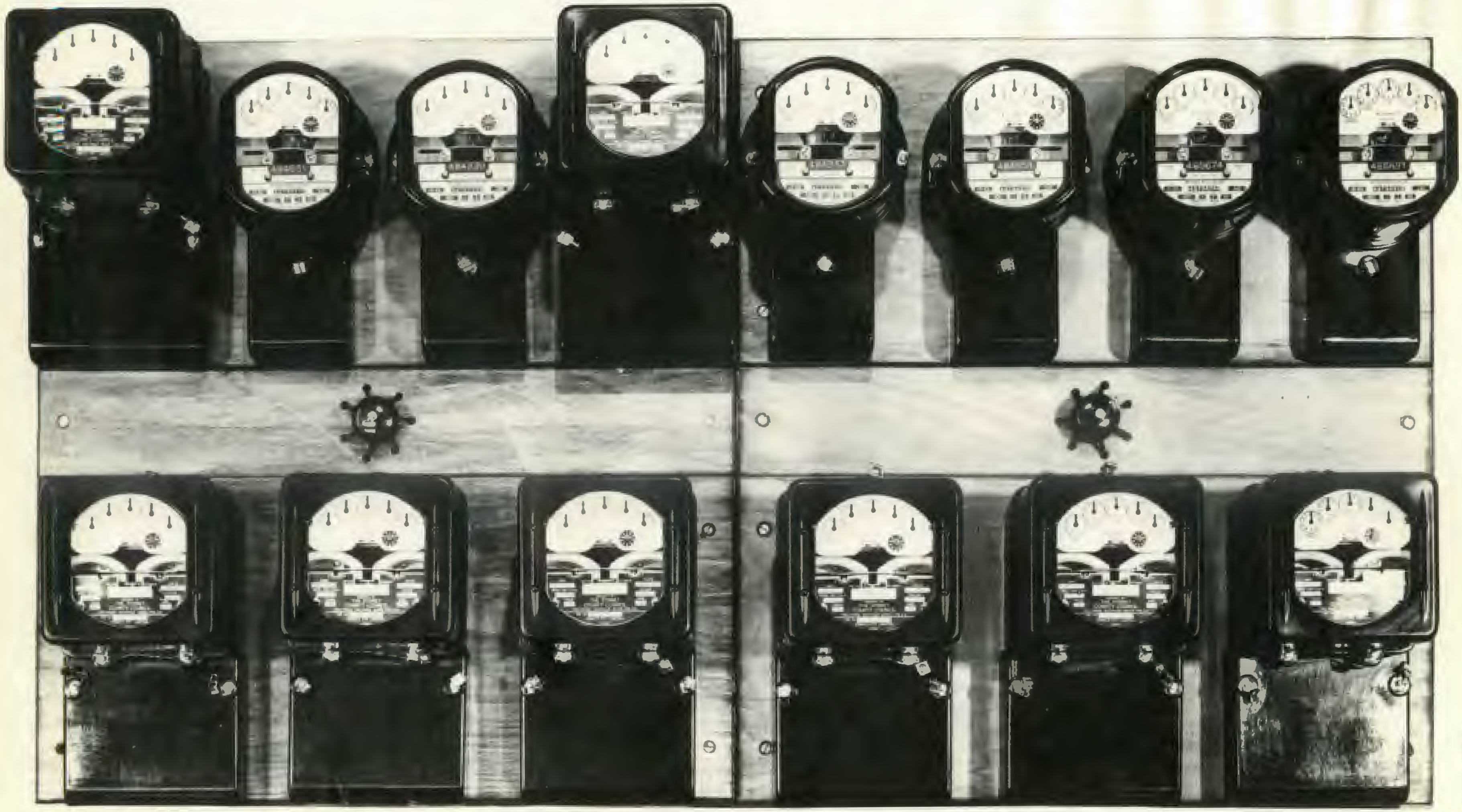

FIGURE 2

12" X 26" WIDE METER BOARDS, WITH ALTERNATE FILLET STRIPS, ABUTTING EACH OTHER IN A HORIZONTAL ROW. NOTE SPACING BETWEEN S.D. TYPE METERS.

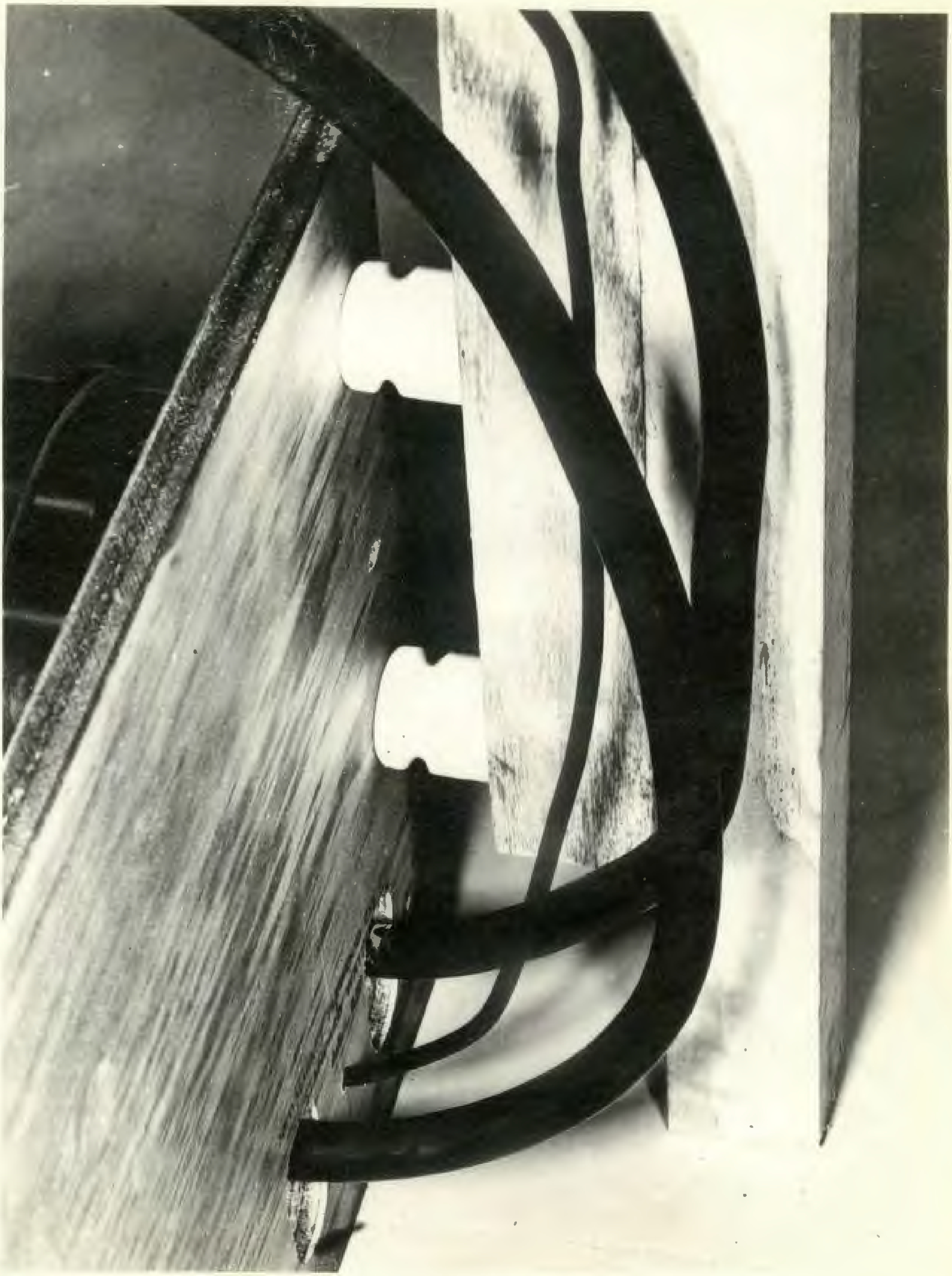

FIGURE 3

DOUBLE BATTENS FIXED WHERE CABLE SIZE IS GREATER THAN **19/·044**

BATTENS

General

All boards must be mounted on softwood battens (dressed-all-round) with wood screws with the exception of the Hinged Service Board which will be mounted on a metal surround.

Sizes

The batten sizes are as follows:-

(a) 2" x 1" for 18" x 12" wide board when used as a replacement on domestic installations in certain other circumstances.

(b) 3" x 2" on edge for 18" x 21" wide board (100/400 amp distribution service cabinet) to be extended, in length if required for the mounting of the 12" x 21" wide board for installation of C.T.'s in standard manner. *

(c) 2" x 2" for all other boards.

Insulators

The following board shall be screwed direct to the battens without button insulators.

(a) All boards for the mounting of service fuses only.

(b) 12" x 21" wide board in standard C.T. installation. (Figures 2 and 3, Section 6).

All other boards shall be secured to battens with button type insulators.

Supply and Fixing by Customer

The battens must be supplied and fixed by the customer in accordance with the Service Rules which state briefly that they shall be securely fixed to the wall or other structure by means of wood or metal thread screws or bolts. Explosive type or other fastening devices may not be used unless they are of the nut and bolt or screw types. The battens must be so installed that they may be easily removed by Council officers in the event of future alterations.

All battens shall be mounted in a vertical position, so spaced that their outer edges will be in line with the outer edges of the board to be used, and of sufficient length to extend from the top to the bottom of the board.

When several boards, including the service board, are mounted vertically, the battens shall be continuous from the top board to the lower edge of the bottom board. The length of batten may be increased to enable the customer's links to be installed under the service fuses as shown in figures 7 and 10 if desired.

Where meter boards are mounted edge to edge in a horizontal row, (figure 2) a single batten, common to both boards may be used. In these circumstances the size must be either 3" x 2" or 4" x 2", mounted on the flat side.

No objection will be made to the battens being checked out for the entry of conduit or cables from the customer's switchboard. If conduits, pipes or other obstructions pass behind or are located behind service or meter boards, the depth of battens must be increased by an amount at least equal to the distance the conduit, pipe or other obstruction projectsfrom the wall.

Supply and Fixing by the Council

When an existing board is to be replaced with a larger board in the same position to accomodate additional meters, the battens shall be supplied and fixed by the Council. However, the customer will provide and fix the battens when the board is to be moved to a new position for any reason.

When fixed by the Council, the battens shall be screwed to the wall with wood screws into wood or "Alex" type plugs.

Particular care must be taken when drilling walls for the fixing of battens. Where possible twist type wall drills used in a drill must be used in preference to other types used with a hammer.

Double Battens.

When metering conductors are in excess of size 19/.044 the Council will provide extra 2" x 2" softwood battens which will be screwed to the battens fixed by the contractor and of sufficient length to extend from the top of the board to a point 4" from the bottom. This batten is commonly called a "Double Batten". This arrangement will allow access at the bottom edge of the board to manipulate the cables into the meter terminals as shown in figure 3.

NOTE:

Meter reducing lugs must be used in most cases where the cable size exceeds 19/.044. See section 10. "Whole Current Metering".

FIXING SCREWS FOR BOARDS AND BATTENS

The following screws shall be used to secure boards and battens in the situations stated:-

Fixing boards to 2" x 2" or 3" x 2" battens,

without insulators, 1¼" x 12 gauge, c/s wood screws
with insulators, 2½" x 12 gauge, c/s wood screws

Fixing boards to 2" x 1" battens,

with insulators, 2½" x 12 gauge, c/s wood screws

Fixing 2" x 1" battens to wall with "Alox" plugs,

1½" x 10 gauge, c/s wood screws

Fixing 2" x 2" battens to wall with "Alox" plugs,

2½" x 10 gauge, c/s wood screws

Fixing 2" x 1" battens to wall with wooden plugs,

1½" x 12 gauge, c/s wood screws.

Fixing 2" x 2" battens to wall with wooden plugs,

3" x 12 gauge, c/s wood screws.

Fixing 2" x 1" battens to wooden walls or studs,

1½" x 12 gauge, c/s wood screws.

Fixing 2" x 2" battens to wooden walls, studs or other battens,

3" x 12 gauge, c/s wood screws.

Fixing Hinged Service Board,

¾" x 10 gauge self tapping screws
into "Alox" plugs or direct into
wooden walls.

SERVICE BOARDS - GENERAL PRACTICE

See Service Rule 7A.

Service fuses, neutral links and meters shall be installed as shown below for the various service boards.

(a) 50 amp. Service: 12" x 26" Wide Board (Figure 4)

The installation of 70 amp. fuses and neutral links must be as shown in figure 4 of this section. The board must be mounted direct on the battens without insulators, enabling the conductors to pass from the load side of the fuses, across the face of the board to the space behind the meter board or as shown in figure 4, through the board to the customer's links. Parallel connections other than the metering neutral conductors to the neutral link are not permitted except as shown on page 2 of this section when an "off-peak" water heater forms an additional to an existing domestic installation.

Adequate space is available for the mounting of customer's connecting links which may be fixed immediately below the fuses on the 12" x 26" wide service board.

This board will be used on multi customer installations, flats, small factories etc. It has the advantage that without changing the board, 70 amp. service fuses may be replaced with 100 amp. service fuses should the load increase in the future.

A series of these boards may be mounted on insulators below the service board for the mounting of meters, each being separated by a 4" x 26" wide fillet board or strip as shown in figure 4. See also figure 2 which shows these boards being used for meters only.

(b) 50 amp. Service: 20" x 26" Wide Board (Figure 5)

This board is designed to accommodate 70 amp. service fuses, neutral link and meters as shown in figure 5 of this section. Unlike the board for service fuses only, it must be mounted on 2" x 2" battens and button insulators.

Being predrilled, the location of the various fuses, meters, etc., is evident. Each meter position is marked for the installation of BAZ, and WF2 type single phase meters and meter connector blocks. The left side position is also marked for a S.D. type polyphase meter.

S.D. type meters may also replace both single phase meters mounted on the left and right sides of the board if required.

Space is available adjacent to the service fuses for the mounting of customer's connecting links, which for this size service will not be of any great size.

(c) 50 Amp. Service: 18" x 12" Wide Board (Figure 2, Section 10)

This board was used in the past as the standard board for all domestic installations and is now superseded by the Hinged Service Board

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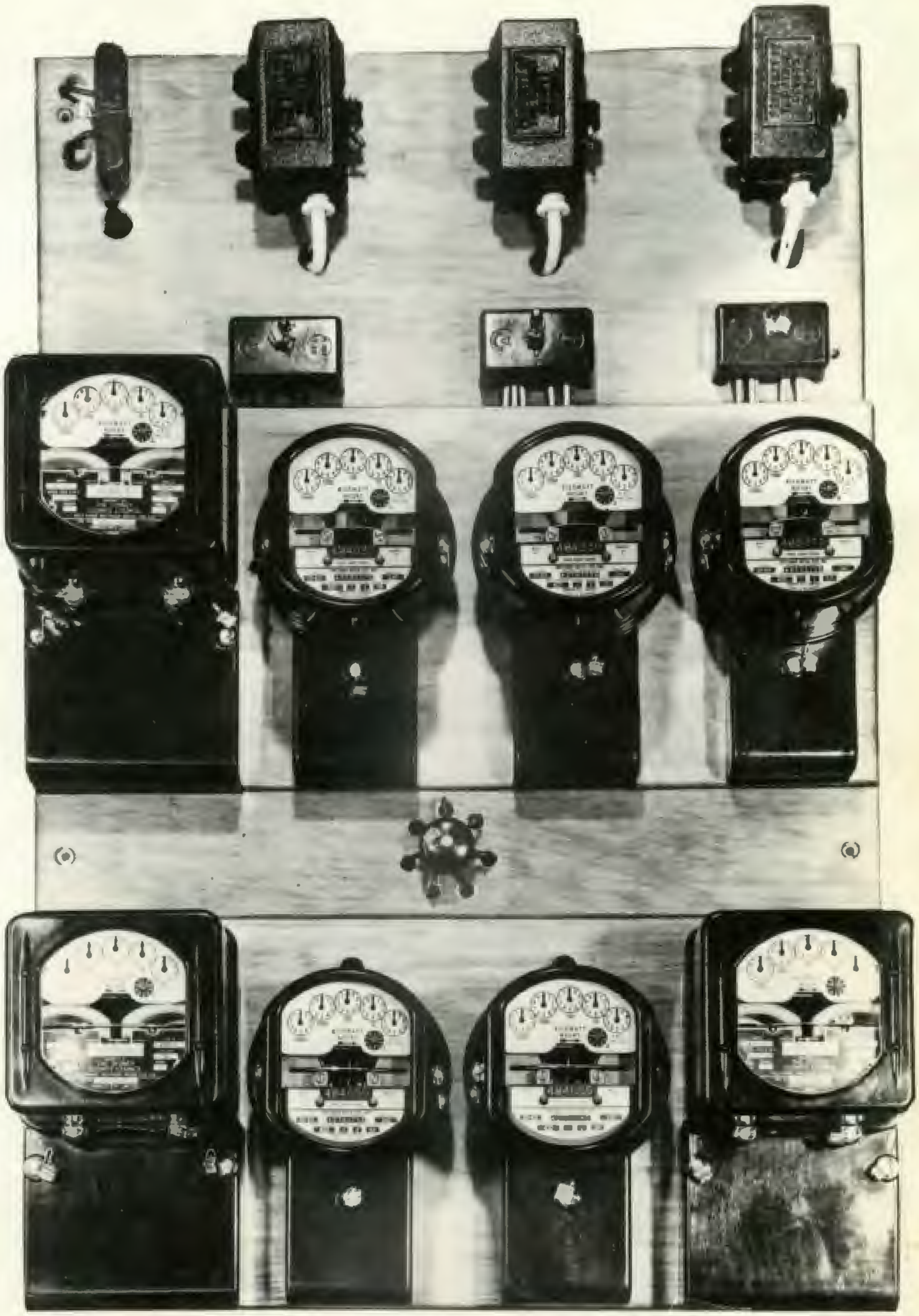

FIGURE 4

50 AMP SERVICE MOUNTED ON A 12" X 26" WIDE BOARD WITH METERS BELOW IN STANDARD MANNER

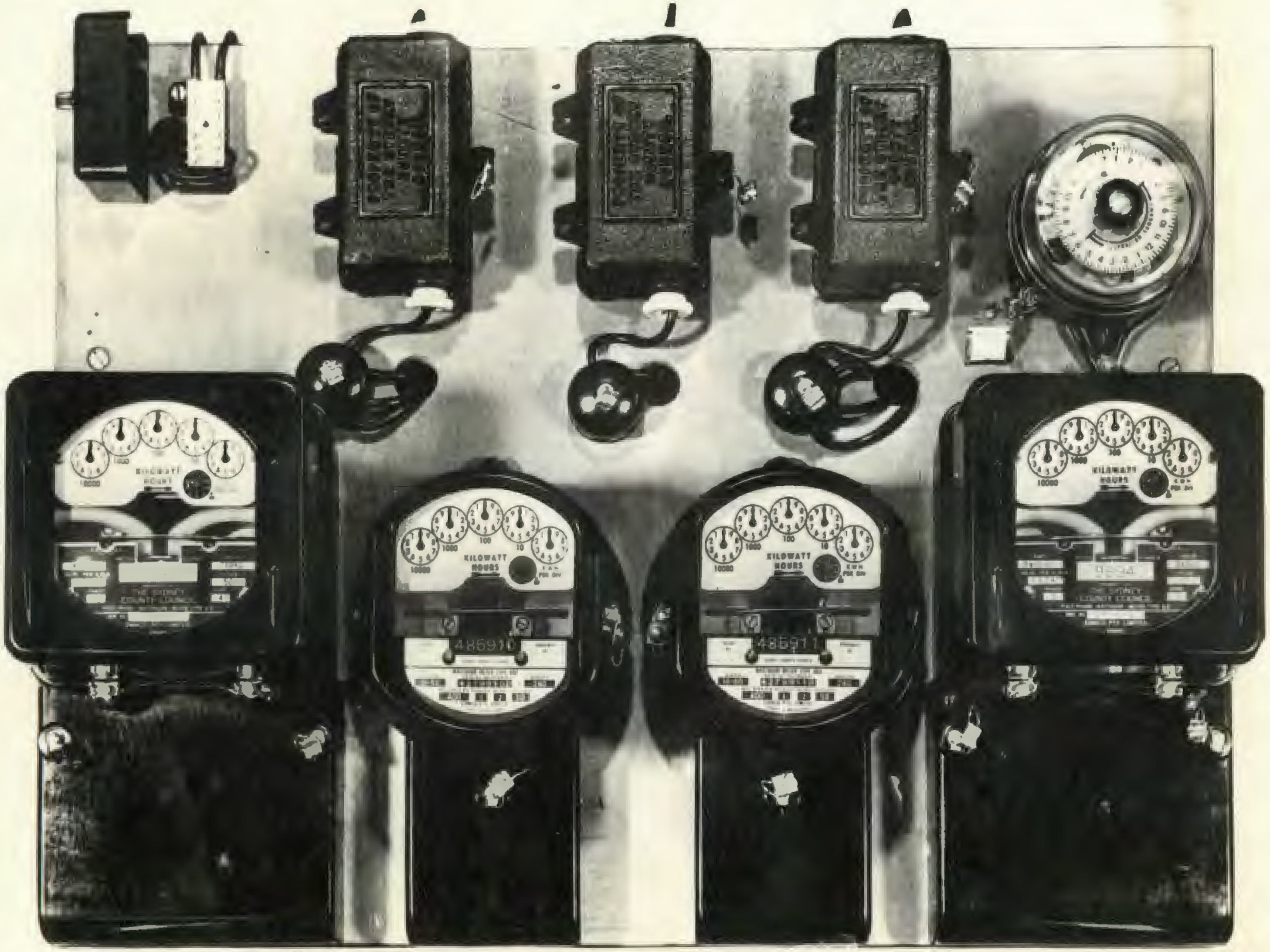

FIGURE 5

50 AMP SERVICE MOUNTED ON A 20" X 26" WIDE BOARD WITH METERS IN STANDARD MANNER

described on page 13. The board was predrilled as shown in Section 10, figure 2.

It is available now as an undrilled board and may be used for replacement purposes in single phase domestic installations or other places at the discretion of the Mains Branch or an Inspection Branch Supervisor.

The board shall be mounted on 2" x 1" battens and button insulators with the neutral link fixed as shown in Section 10 figure 2. Holes must now be drilled in lieu of the cut away section for the metering neutral conductors.

(d) 50 Amp. Service: 12" x 18" Wide Board (Figure 6)

This is the predrilled board used with the metal Service Surround as the Hinged Service Board, but in this case it will be erected on 2" x 2" battens and button insulators.

Its particular use is for installation on the front wall of premises over footways in the City of Sydney area. In many of the older premises the meters are within the building and are therefore inaccessible. The front wall is generally the only suitable metering position and due to pedestrian traffic, the board must be installed at a height which is not suitable for the Hinged Service Board, but this board may be installed with the service fuses and neutral link mounted as shown in figure 6 of this section. The line side of the fuses shall be the top side of those vertically mounted and on the left side of the one horizontally mounted.

A S.D. type polyphase meter may be installed on the left side in the predrilled position.

Additional holes must be drilled as shown in the diagram for the passage of conductors where the existing predrilled holes do not suit. Holes must also be drilled for the mounting screws.

This board may also be installed in this fashion in other positions at the discretion of the Mains Branch or an Inspection Branch Supervisor.

(e) 50 amp. Service: 21" x 18" Wide Board (Figure 6A)

This board is used for the mounting of 70 amp. service fuses and meters as shown in figure 6A of this section and must be erected on 2" x 2" battens and button insulators.

Its particular use is in single domestic installations where the consumers mains are larger than 7/.064" for single phase or larger than 7/.044" for multi-phase supply. Where the mains are less than these sizes, for a single domestic installation the Hinged Service Board shall be used.

The same number and combination of meters, time switches etc., may be installed on this board as on the Hinged Service Board and space is available for the mounting of customer's connecting links if required.

This board may be installed in other positions at the discretion of the Mains Branch or an Inspection Branch Supervisor.

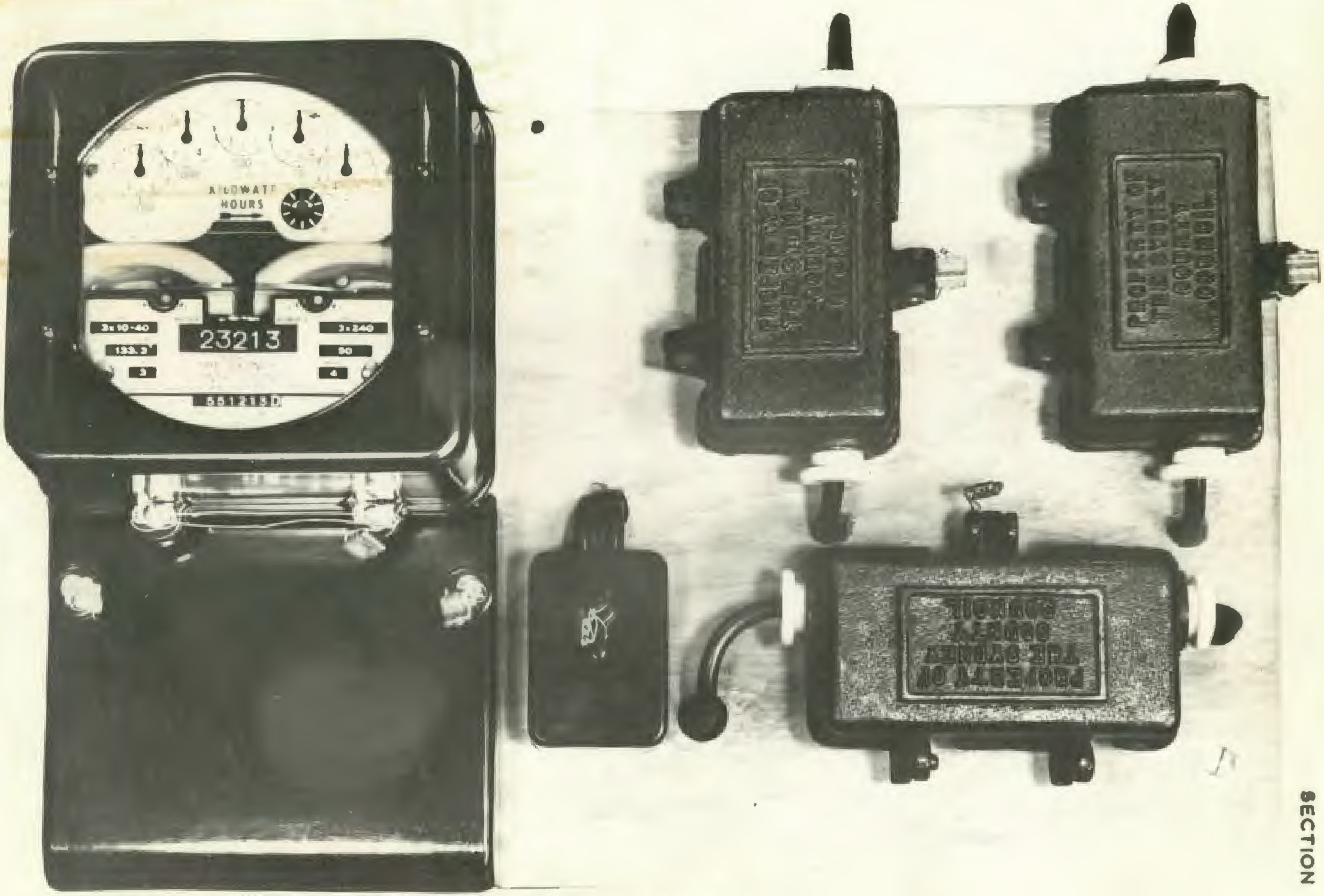

FIGURE 6

50 AMP SERVICE MOUNTED ON 12 X 18 WIDE BOARD
WITH POLYPHASE METER

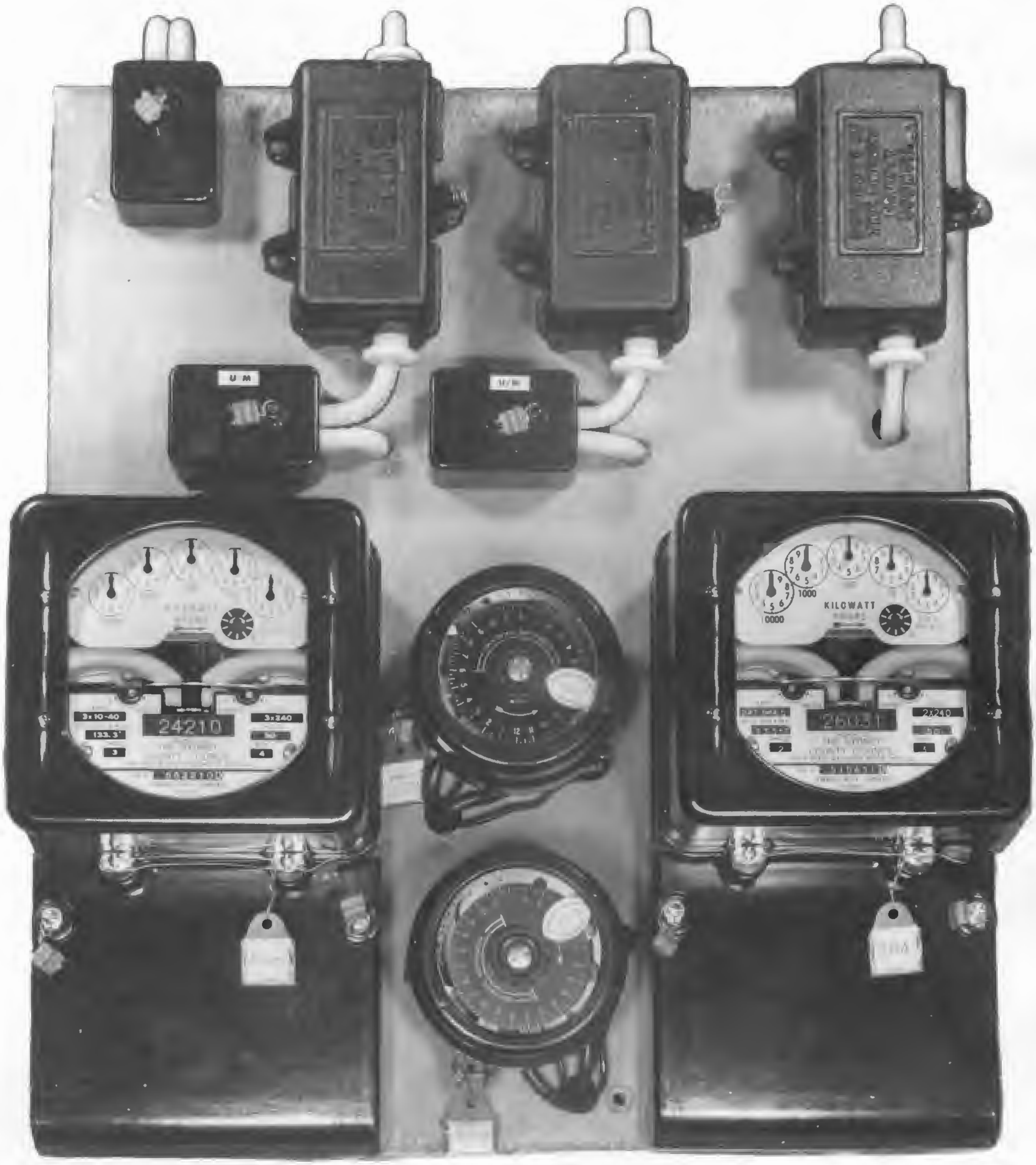

FIGURE 6A

21"X 18" WIDE BOARD FOR SINGLE DOMESTIC INSTALLATIONS WHERE CONSUMERS MAINS ARE LARGER THAN 7/·064 FOR SINGLE PHASE OR LARGER THAN 7/·044 FOR MULT-PHASE SUPPLY.

NOTE:— THE NUMBER OF TIME SWITCHES LINKS & SERVICE FUSES & NUMBER OR TYPES OF METERS MAY BE VARIED AS APPROPRIATE.

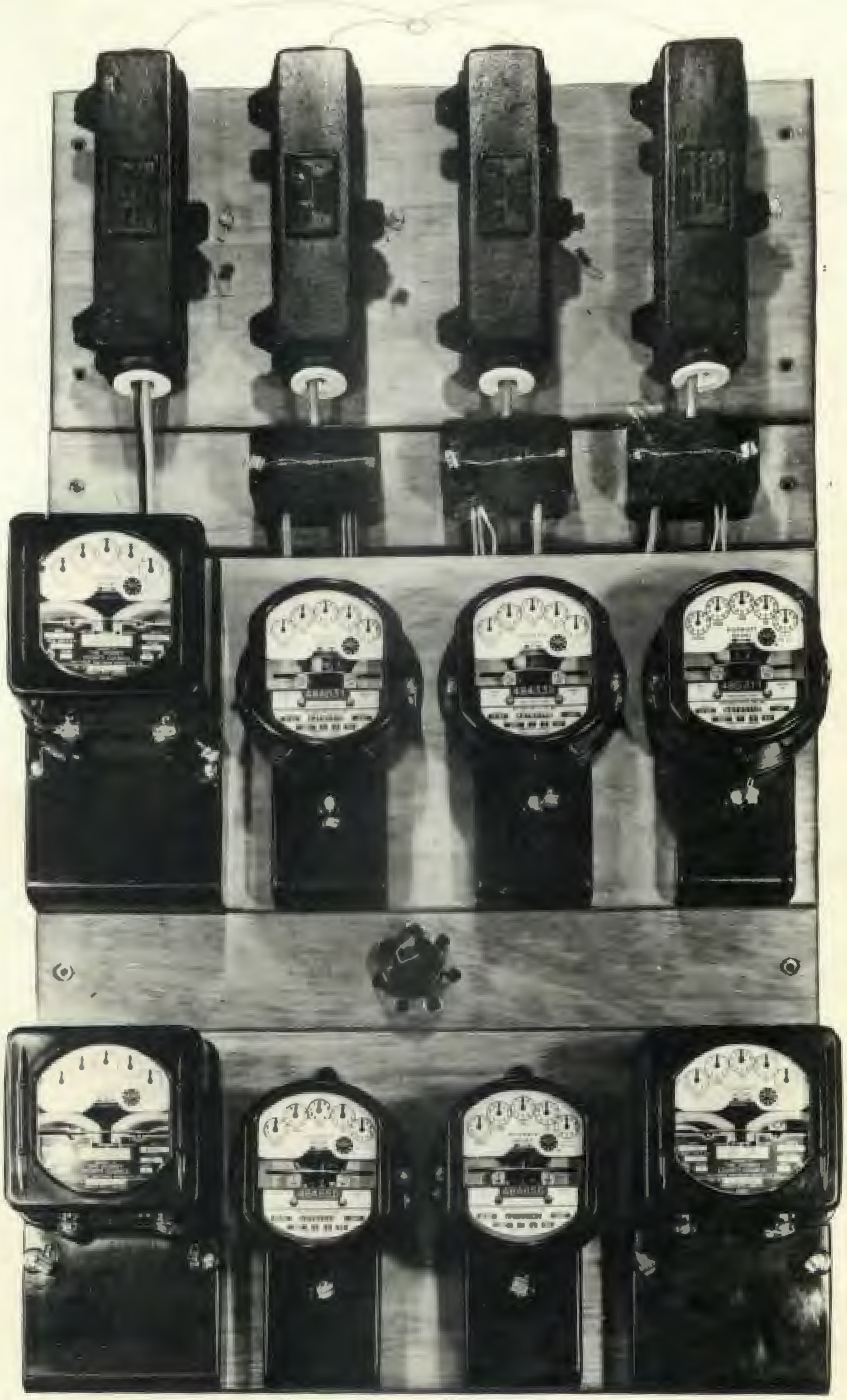

FIGURE 7

100 AMP SERVICE MOUNTING ON A 12" X 26" WIDE BOARD WITH METERS BELOW IN STANDARD MANNER

(f) 100 Amp. Service: 12" x 26" Wide Board (Figure 7)

The 100 amp fuses and neutral bar must be installed on a 12" x 26" wide board as shown in figure 7 of this section. The board will be mounted direct to the 2" x 2" battens without insulators enabling the conductors to pass from the load side of the fuses, across the face of the board to the space behind the meter board OR as shown in figure 7, to the customer's links. Where heavy cables are used, a space of approximately 1 inch is required between the two boards.

This board will be used on all 100 amp. installations where the load is not likely to increase. Where it is likely that the load will increase in the future, the Mains Branch will install a Service Cabinet.

Connecting links must not be installed on this board. They may however, be mounted under the board on a 4" x 26" wide fillet strip as illustrated. The links and mounting board are to be supplied by the customer.

The connection of metering neutral and potential conductors may be made in the tunnel type load terminals of the neutral link and service fuses with the main conductors. Parallel connections other than these are not permitted.

(g) Service Cabinet (100/400 Amp. Distribution Service Fuse Cabinet.(Figure 8))

Description.

This cabinet is a pressed metal fabrication which will accommodate either 100, 200, 300 or 400 amp. HRC type cartridge fuses. The hinged door is removeable.

The ½" diameter load terminals are designed for the connection of busbars direct or for cables into the clamp type cable connecting lugs. Four cable entry holes are provided in the back of the cabinet for the passage of metering neutral and potential conductors and for a cable not greater than 7/.064 for one separately metered portion. When it is necessary to use these cable entries, a hole of smaller diameter shall be drilled in the mounting board, thus protecting the cables from the sharp edges of the cabinet.

The end panels consist of split bakelite pieces having four 1½" diameter cable or busbar entry holes. Rubber bushes are provided for insertion in the holes in the following sizes: ⅞" dia. and 1" dia. for cables and 1-5/16" x ¼" slot for busbars.

In the early type of cabinet, the rear half of the end panels is 2½" wide, the cable entry holes being in line with the cable tunnel of the connecting lug. When a bar is used, it will be found that it cannot be connected due to the entry holes being off set for the lug connections. To overcome this difficulty, a ⅜" wide strip must be cut off the unbroken edge of the larger section of the split panels, this strip must then be placed at the back of the cabinet, followed by the narrow strip which was formerly in the front, and then by the strip from which the ⅜" strip was cut.

The end panels in the present type cabinet are designed so that bars may pass direct to the terminals without alteration in any way. However, when cables are installed, the cables may need to be bent slightly to line up with the connecting lugs, which may be reversed if there is adequate clearance betw

METERING INSTRUCTION BOOK - SECTION 14.
Pages 9 to 12 superseding pages 9 to 12 issued June, 1963

the connecting lugs and the rear of the cabinet.

Installation

The cabinet will be installed by the Mains Branch on a 18" x 21" wide board, screwed direct to the 3" x 2" battens without insulators, or in some cases other special mounting arrangements may have been made.

When one set of C.T.'s are installed adjacent to the cabinet, the standard arrangement shall be used, the Council providing and installing the busbars to the load terminals of the cabinet as shown in Section 6 "C.T. Metering". Two tapped holes are provided in each bar within the cabinet, one for Council use (neutral and potential conductors) and the other for the connection of a cable not greater than 7/.064 for a separately metered portion as shown in figure 9 of this section.

Similarly, in installations other than the standard arrangement, where a customer has provided bars for connection to the cabinet load terminals, a single parallel connection may be made to each bar within the cabinet if the cable size is not greater than 7/.064.

Where cables are connected to the load terminals, and it is necessary to connect metering neutral and potential conductors to the cabinet, they shall be spread and inserted in the clamp type terminal under the main conductors.

Parallel connections from the cabinet load terminals other than those above shall not be permitted. Links must be provided by the customer for all other cases, a typical example is shown in figure 10 of this section.

If the incoming or outgoing mains are larger than .3 sq. inches, (37/.103) connection bars must be provided by the customer to the dimensions shown in figure 11, except that where links are installed immediately below the cabinet as in figure 10 the bars need only be long enough to make a satisfactory connection to the links. The bars shall be connected to the cabinet terminals by the Connecting Officer, the connection of mains to the bars must be made and insulated by the customer.

Connection bars connected to the line terminals of a cabinet are shown in figure 9.

It should be noted that the Connecting Officer shall make all connections to the load terminals of the cabinet, the Mains Branch staff will connect the line side only.

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100/400 AMP DISTRIBUTION SERVICE FUSE CABINET

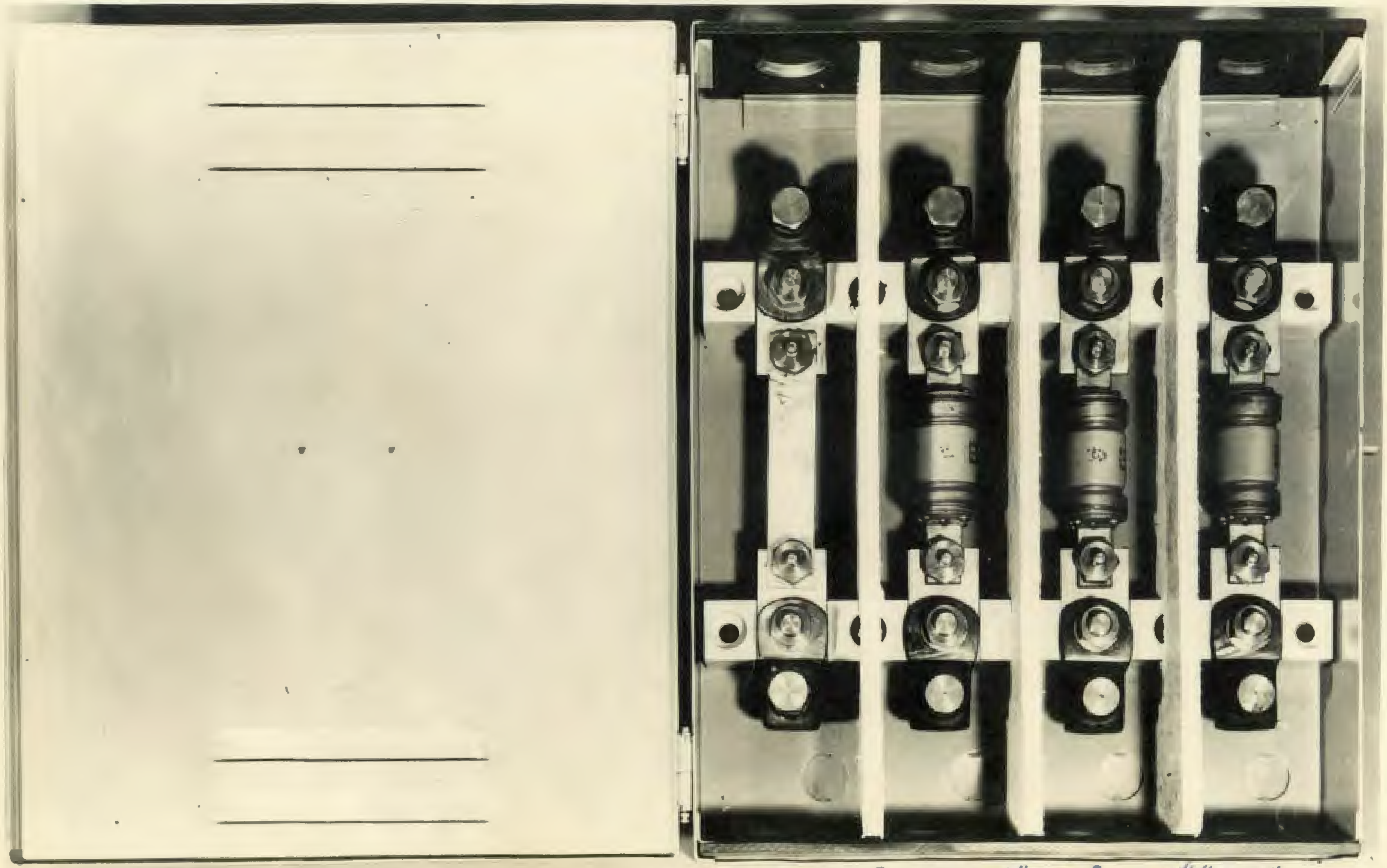

FIGURE 8

Dimensions:- 17" H. x 14" W x 4½" Depth.

100/400 AMP DISTRIBUTION SERVICE FUSE CABINET

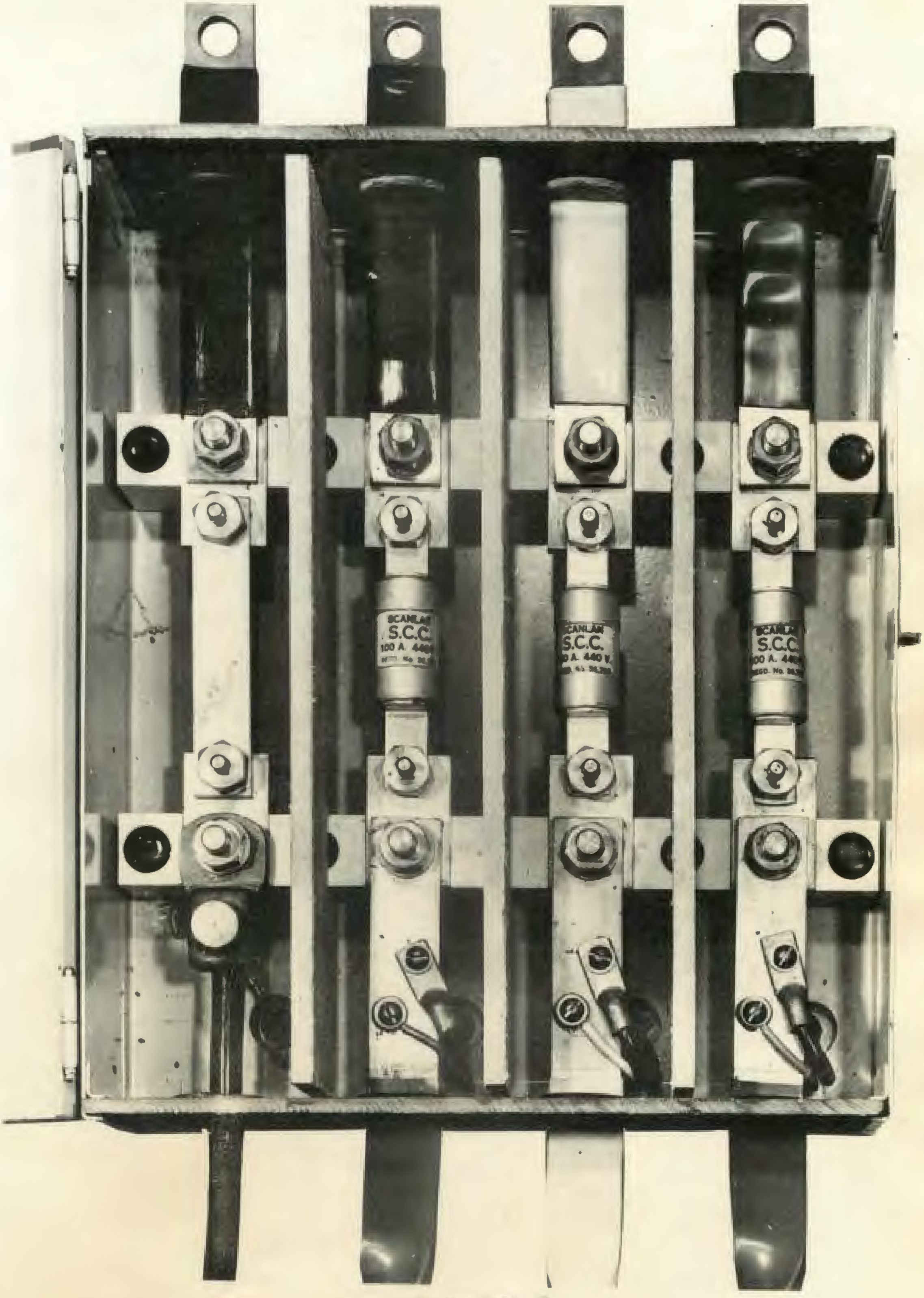

FIGURE 9

100/400 AMP DISTRIBUTION SERVICE CABINET WITH PARALLEL CONNECTIONS MADE TO STANDARD C.T. BARS AND CONNECTION BARS CONNECTED TO THE LINE TERMINALS

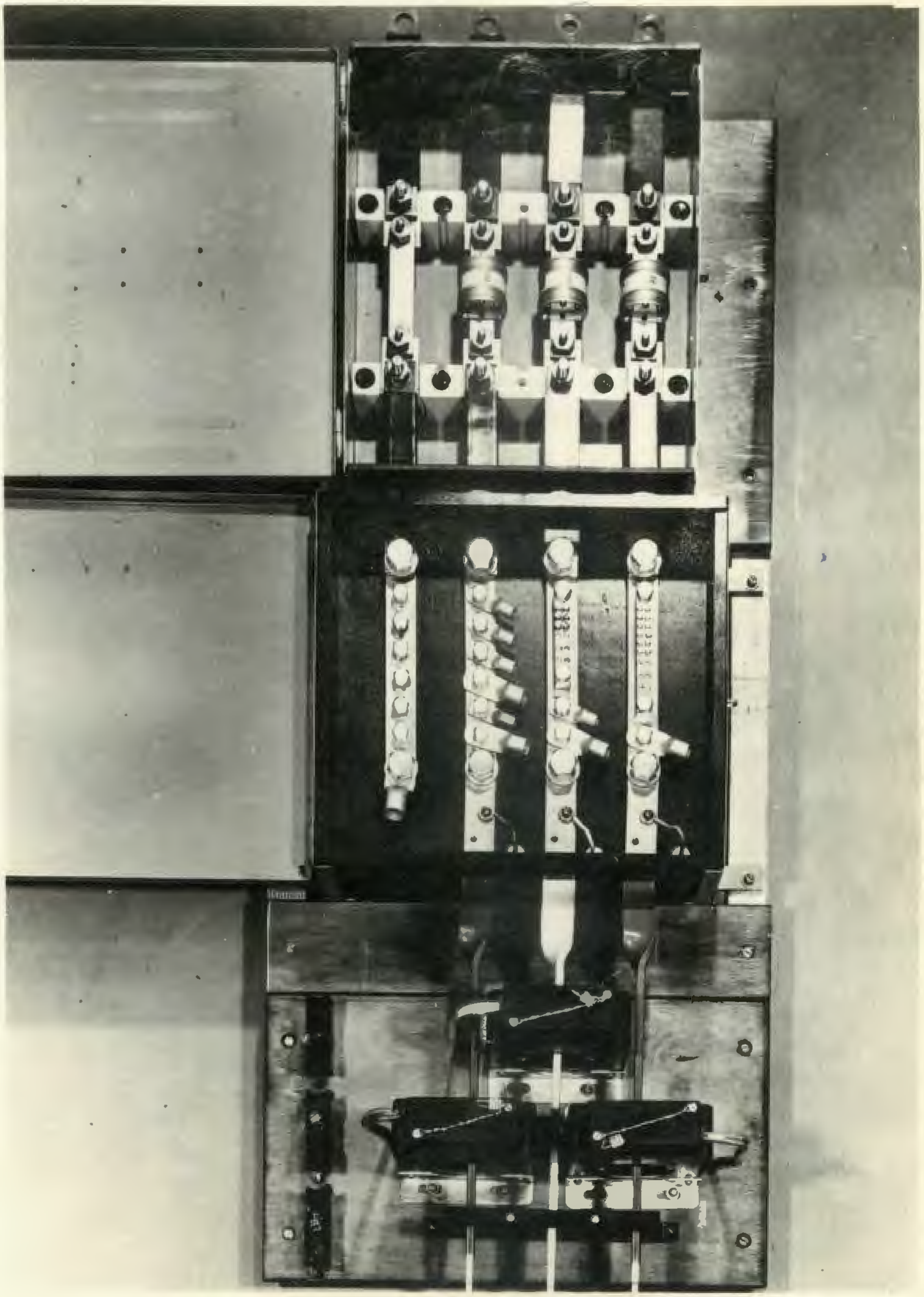

FIGURE 10

TYPICAL EXAMPLE OF LINKS CONNECTED TO 100/400 AMP DISTRIBUTION SERVICE FUSE CABINET

NOTE: DESIGN PERMITS USE OF STANDARD C.T. BARS

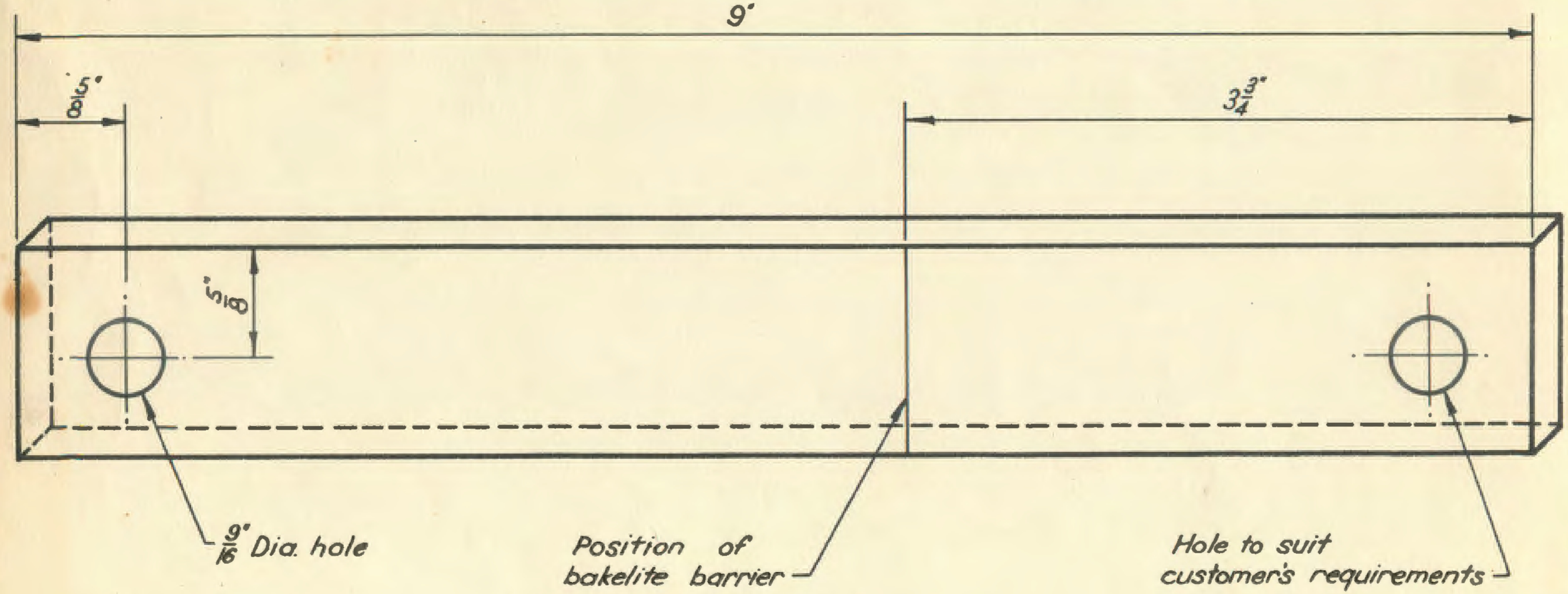
9"
5/8"
3 3/4"
5/8"
9/16" Dia. hole
Position of bakelite barrier
Hole to suit customer's requirements

FIGURE 11

CONNECTION BAR MATERIAL : 1¼" X ¼" COPPER

TO:

Sent to:
Copy to:

INSTALLATION OF SERVICE FUSES ON THE "HINGED SERVICE BOARD"

The Hinged Service Board and associated Compact Service Box which were the predecessors of the Standard Meter Box and Panel have 70A porcelain-base fuses mounted on the back of the board. If it is necessary to replace these for any reason or install additional fuses, 100A Nilcrom or Henley service fuses shall be used.

The fixing of replacement or additional service fuses to the Hinged Service Board shall be carried out in accordance with the attached pages 13 to 17 which are issued as Amendment No. 37 of the Metering Instruction Book. Holders of the book shall insert the new pages and remove the superseded pages.

Right-angle mounting brackets which were made up as an interim measure, may be used as an alternative to the clamping bar until existing stocks are depleted.

This instruction is issued on an interim basis pending preparation of the Metering Technical Instruction Manual, Volume 1 - Field Procedure.

Act. EE-S

Attach./

SERVICE AND METER BOARDS

THE HINGED SERVICE BOARD

This type of board (See Figure 12) was superseded by the Standard Meter Box Panel. The maximum size of consumers mains used with it did not exceed 7/.064 for single phase installations and 7/.044 for multi-phase installations. However, where an increase from single to multi-phase is required in an existing installation, the use of cable sizes of up to 16mm^2 is acceptable.

Cables may pass through the knock-out in the surround or may pass through the back of the surround provided they do not obstruct the opening and closing of the panel.

The 305mm (H) by 457mm (W) plywood board is provided and, if necessary, replaced by the Council. A hinging device is fitted to the back of the board to allow it to open downwards to an angle of 90 to 115 degrees. On opening the board, its lower edge rises up the face of the surround, thus providing a clearance between the meters mounted on the face of the board and any switchboard or equipment immediately below.

Where a board has to be replaced, the existing hinge fittings must be transferred to the new board. The hinging rods are fitted to the surround by springing the rods together and inserting the ends in the sockets provided in the surround. Excessive force in springing the rods should be avoided as it will distort the hinging mechanism.

A clip attached to the bottom of the board engages with the surround when the board is in the closed position, thus preventing the board from being opened from the bottom edge.

A self-tapping screw is passed through the hole in the brass tab and then through the board into a "speed nut" clipped to the surround. If the speed nut does not remain in position over the 12mm dia. hole in the surround, adjust the clip with a pair of pliers. Do not exert undue pressure on the screwdriver when tightening the self-tapping screw.

The brass tab must be bent up over the head of the screw. A wire seal is then applied between the brass tab and the loop in the top of the surround.

Where a hinged service board is installed on a wall below a ceiling or roof, a clearance of at least 380mm is required between the back of the service board when opened at 90 degrees and the ceiling immediately above it.

The depth of any enclosure provided around the surround must be at least 280mm, assuming that the surround is mounted on the same surface as the enclosure. There must be not less than 185mm from the front of the board to the inside of the lid of the enclosure when in the closed position. The enclosure generally used was the Compact Service Box.

A customer's switchboard may abut either side (B or C in Figure 13) of the surround, provided that if any equipment mounted thereon is more than 100mm in depth, a clearance of 50mm must be maintained between the service board and that equipment in order to provide access to the equipment. No clearance is required below the bottom of the board.

INSTALLATION OF SERVICE FUSES AND METERS

As originally installed, the service fuses were of a porcelain-shrouded type designed for 70A rating, located, together with a neutral link, on the back of the hinged board as shown in Figures 14, 15 and 16. Where it is necessary to replace the old style fuse fittings or install additional service fuses, all fuses on the board shall be replaced with Nilcrom or Henley 100A fuse fittings currently stocked for use as service fuses. They shall be installed as shown in the sketch on Page 17. The arrangement must be such that all cables can be withdrawn readily from the terminals of the fuses and the fuse carrier withdrawn towards the operator when the board is in the open position.

The consumers mains on the line side must be terminated in the left hand side of the service fuse, with the neutral terminated in the left hand side of the neutral link. Up to two meters on separate tariffs may be connected to the right hand side terminals of the service fuse. Where active links exist as shown in figure 16, they are to be removed.

The clamping bar Stock Line OW0235 shown in the diagram is suitable for use with both types of service fuse fittings. However, as the widths of these fuses differ, (50mm for the Nilcrom design and 45mm for the Henley), different wood screw sizes are necessary as follows:-

Nilcrom - 2½" x No. 10
Henley - 2¼" x No. 10

Meters must be mounted as shown in Figures 17 to 23. The time switch or relay, if required, must always be mounted in the centre position.

The following steps must be followed when fixing and connecting polyphase meters on this board and similar precautions should be taken when mounting and connecting single phase equipment.

1. Using the appropriate template, mark the board for the meters required.
2. Open the board and with test lamps, check that the supply neutral is connected to the neutral service link and that it is at approximately earth potential.
3. Check with test lamps between the neutral link and each phase service fuse to ascertain the presence of 240 volt supply.

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4. Check and note the phase sequence of the service fuses to facilitate meter connections. See Section 9 - "Phase Sequence and Phase Relationship".

   Note: The procedures in 2, 3 and 4 above shall also be carried out on metering links where the service is installed in a position remote from the meters.

The procedure for replacing the old style fuse fitting is as follows:-

1. Insert the plastic shielding plugs which have been issued for the purpose, on the line sides of the fuses.

2. Withdraw cables from the load terminals.

3. One at a time, remove and temporarily insulate the line side consumers mains conductors from the service fuses.

4. Remove the porcelain type fuse fittings and install Nilcrom or Henley service fuses as shown in the sketch. Note that the fixing screws must not project through the front of the board.

5. If the meters are connected by means of obsolete meter connector blocks and pigtails, remove the blocks and connections and fit meter connector blocks of the current design.

6. Make all necessary connections with the exception of the line connections to the meter connector blocks. Prepare the ends of the cables from the load side of the service fuses for connection to the line terminals of the meter connector block. It should be noted that the conductors from the A and C phase service fuses must be arranged in the manner shown in Figure 16 so that sufficient length is available to enable them to be interchanged at the service fuses should the phase sequence become reversed at any time in the future.

7. Close the board and make the line connections to the meter connector blocks.

8. Fix the meter in position.

9. Lower the board on its hinges and verify and connect the customer's neutral conductor at the service neutral link.

10. Strip and bind the metering neutral conductors external to the service board, where this has to be completely replaced, and connect them between the neutral link and the meters.

11. Pass the consumers mains cables from the customer's installation through the appropriate holes to the front of the service board.

    Strip, bind and connect these to the connector block load terminals.

12. With test lamps, verify that the neutral conductor is connected to the meter neutral terminals and that the three different phases are available at the load terminals of the meter.

13. Check that the phase sequence is correct at the meter line terminals. It should be anti-clockwise in accordance with Section 9 - "Phase Sequence and Phase Relationship".

14. Apply the single phase load test between earth or any verified neutral terminal at each of the load terminals of the meter in turn and note that the disc rotates in the correct direction.

    Note: All cables must be arranged in a neat and workmanlike manner, so that they will not be jammed behind the board when it is closed. (See Figures 14, 15 and 16).

    When the neutral link is of the type shown in Figure 16, the metering neutral conductors shall be connected to terminals at the sides. The two-screw terminal adjacent to the main terminals may be used for the connection of the main earthing conductor.

Important note - Sealing wire must never be left in a long length or attached to a spool when binding cable ends at the rear of the board. The wire must be cut to the length required for the particular cable.

METERING INSTRUCTION BOOK SECTION 14
Amendment No. 37 - 1st October, 1980 supersedes pages 13-17 inclusive

MOULDED FUSE FITTING TYPICAL INSTALLATION UTILISING CLAMPING BAR

(Amdt. No. 37, 1.10.80)

SECTION 14

METERING INSTRUCTION BOOK SECTION 14

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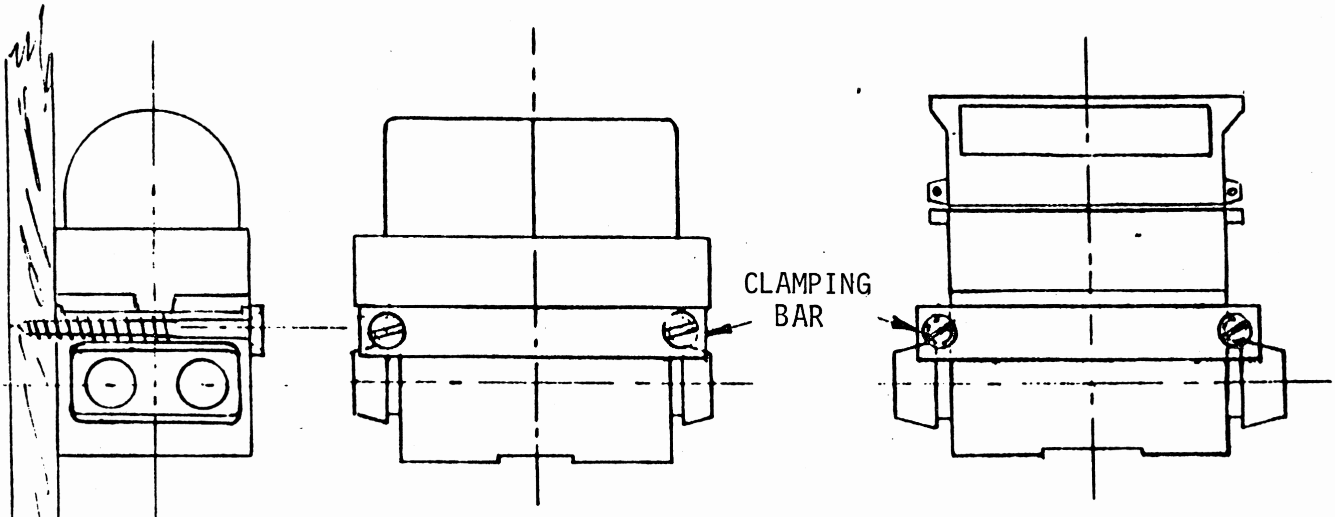
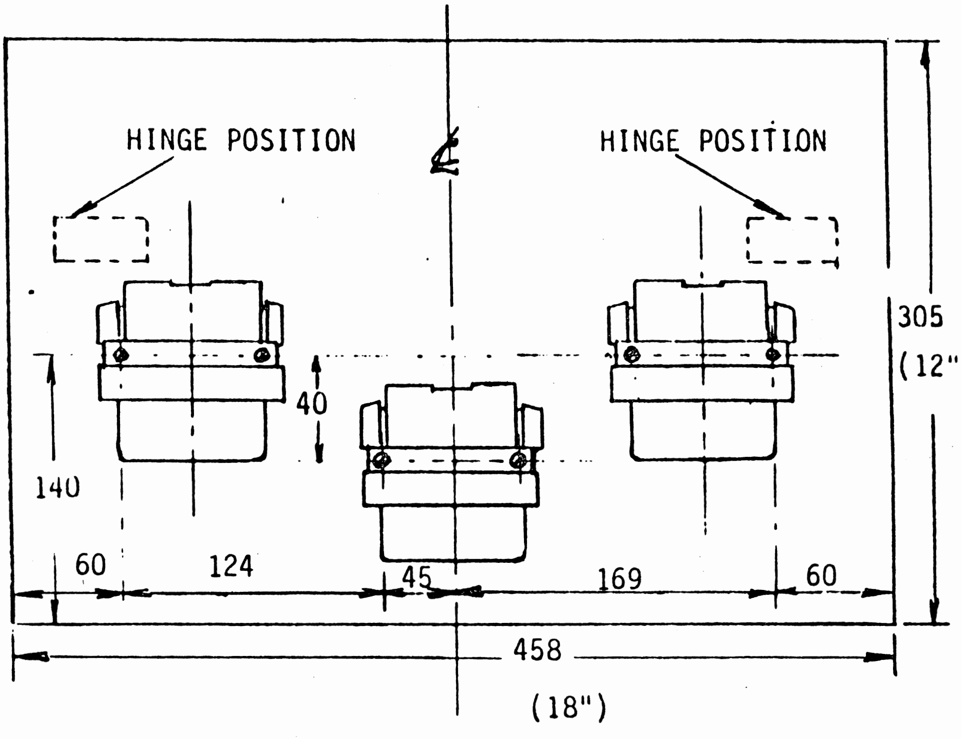


END VIEW (FUSE FITTING MOUNTED ON REAR OF PANEL)

NILCROM

HENLEY/AEI



LAYOUT OF MOULDED FUSE FITTINGS AT REAR OF PANEL

ALL DIMENSIONS EXPRESSED IN MILLIMETRES

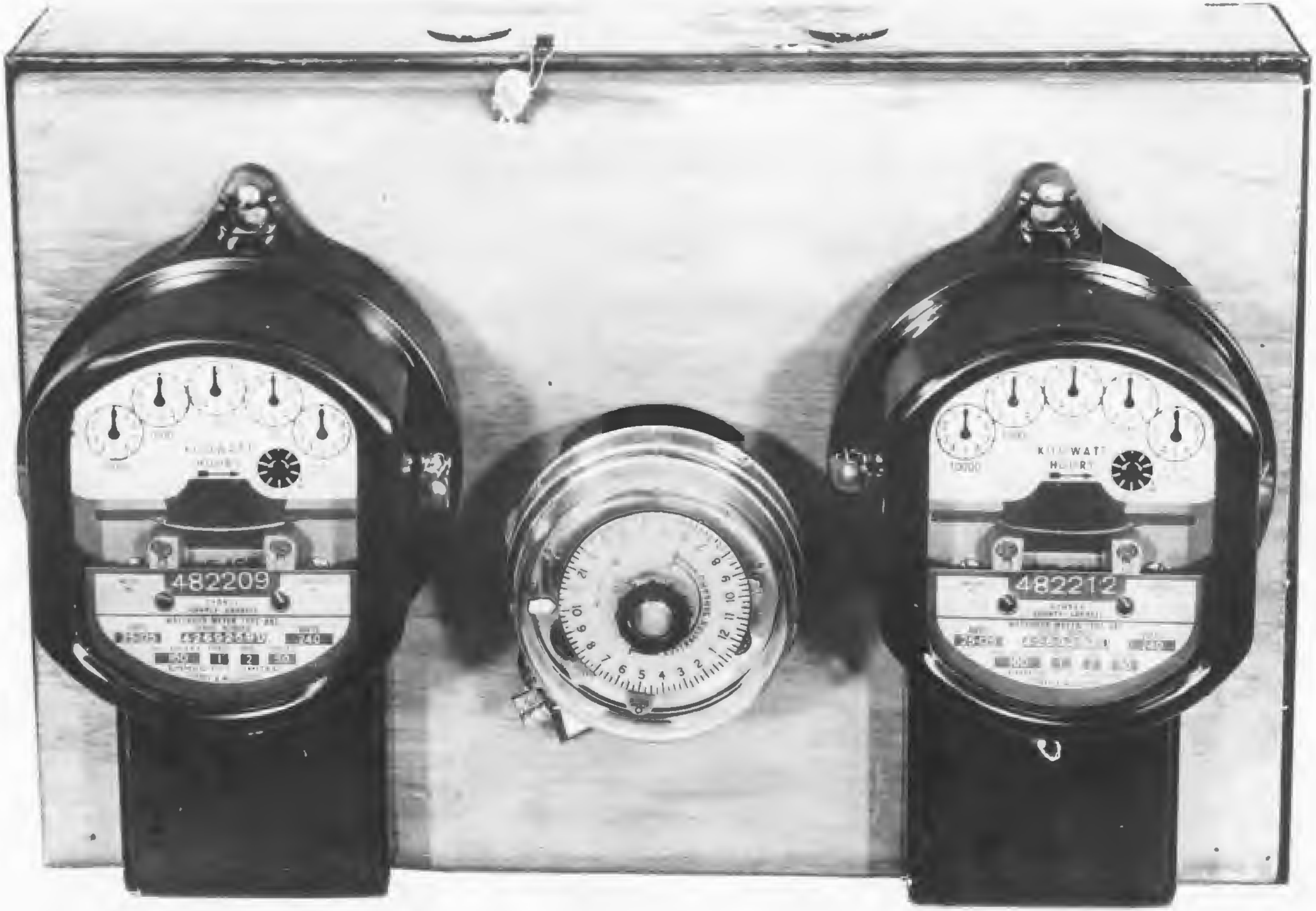


FIGURE 12

HINGED SERVICE BOARD FOR A SINGLE PRIVATE RESIDENCE

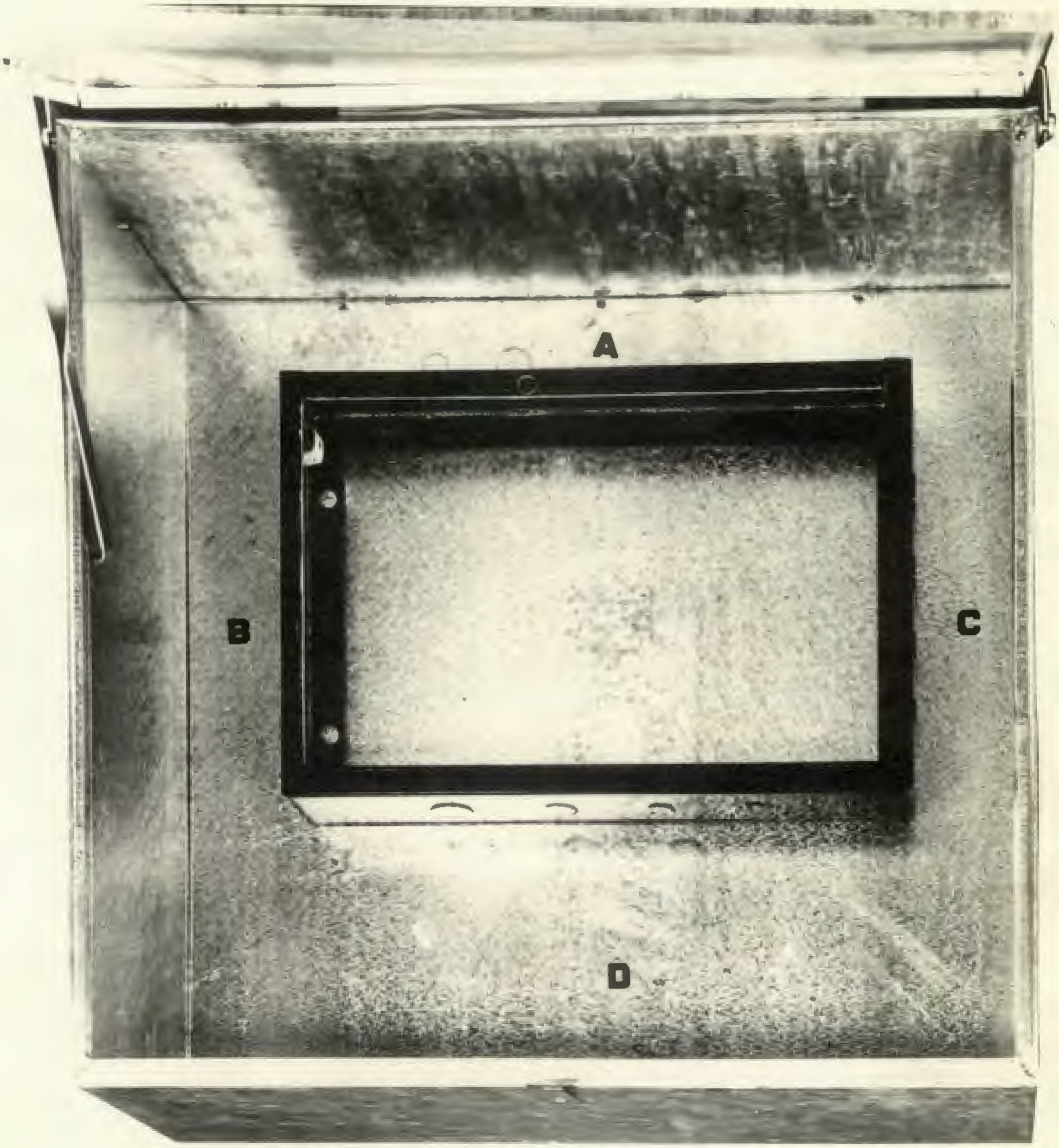


FIGURE 13

SERVICE SURROUND MOUNTED IN BOX OR RECESS OTHER THAN COMPACT **SERVICE BOX**

COMPACT SERVICE BOX WITH SERVICE SURROUND FOR THE HINGED SERVICE BOARD, FIGURE 24.

This board and surround are similar in all respects to those described above except that they are mounted in a Compact Service box which is also built to Council specifications and is available through the normal trade channels to the electrical contractor. The Compact Service Box must also bear an approval sticker in addition to the one on the surround.

Description

Four rails are fixed within the box to allow the surround to slide forward to a position in line with the front edge of the box, giving access to the meters for testing etc., it may then be hinged down in the usual manner.

When the surround is pushed to its normal position at the back of the box, a metal spring retaining catch which is fixed over the top of the surround secures it in the returned position. To slide the surround forward it should firstly be pushed slightly back to allow the catch on the spring arm to come free of the slot in the surround.

Because the surround may slide forward into a position where the board and metering equipment will project beyond the front edges of the compact box, no additional space is required around the surround.

When the surround is secured by the spring catch in the normal position at the back of the box, there is a clearance of ½" between the back of the box and the back edge of the surround which provides a passage for cables; the knockout holes in the surround must not be used where it is mounted in a compact service box. See figure 15.

No clearance is required below the surround. The customer's switchboard may abut the lower edge as shown in figure 24.

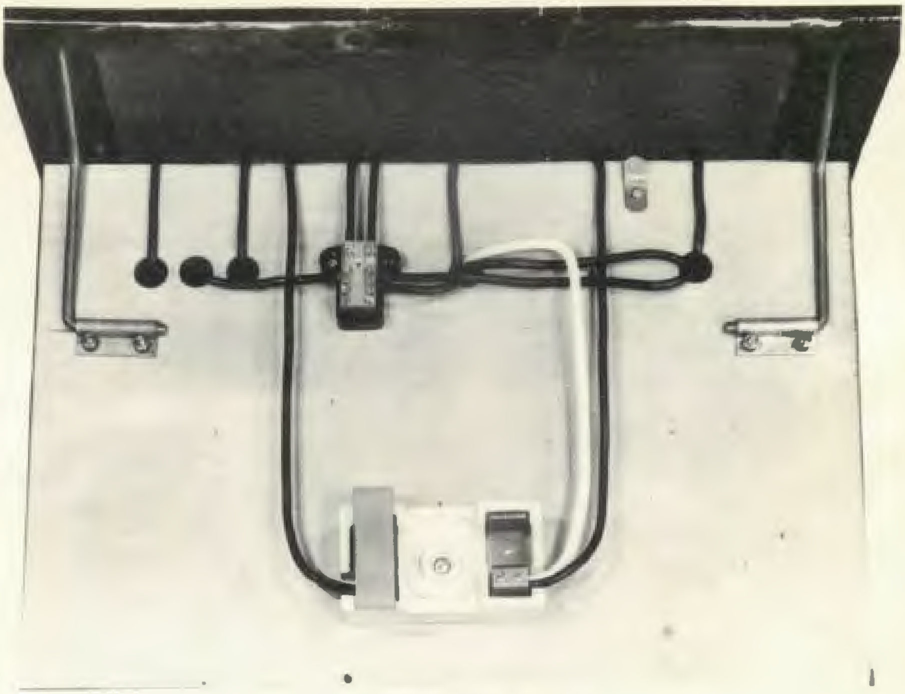


FIGURE 14.

HINGED SERVICE BOARD SHOWING CONNECTIONS FOR TWO SINGLE PHASE METERS AND A TIME SWITCH

NOTE: PROTECTING PLUG INSERTED IN LINE SIDE OF OLD TYPE SERVICE FUSE

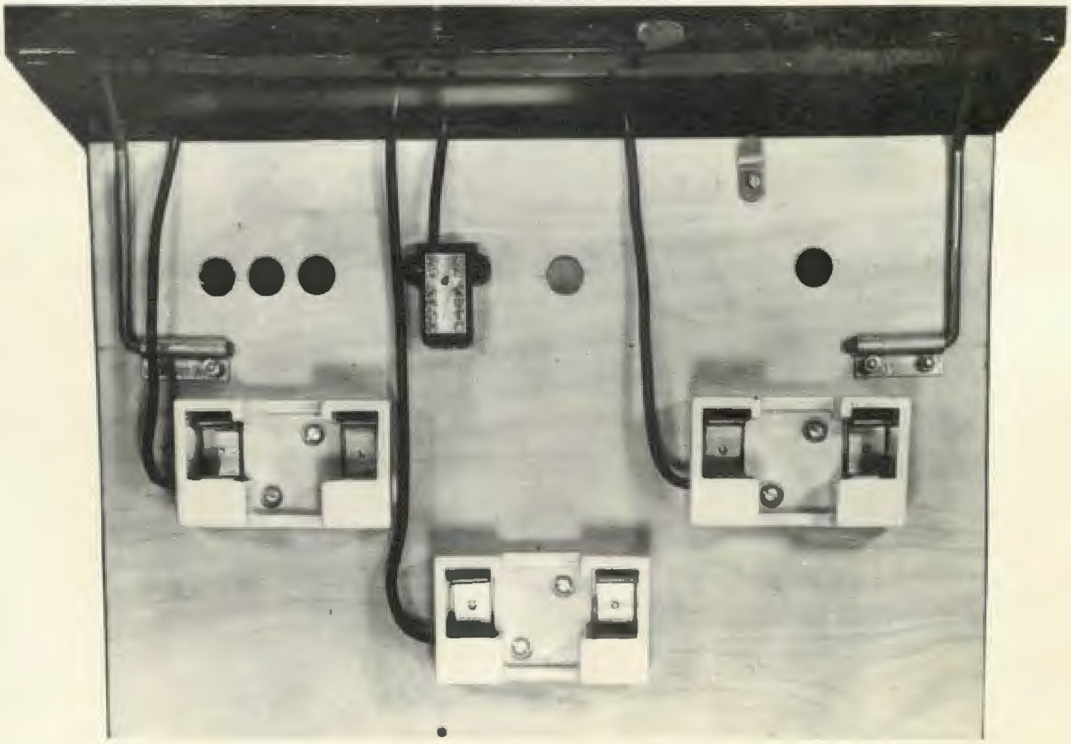


FIGURE 15.

HINGED SERVICE BOARD SHOWING CONNECTION OF CONSUMERS MAINS

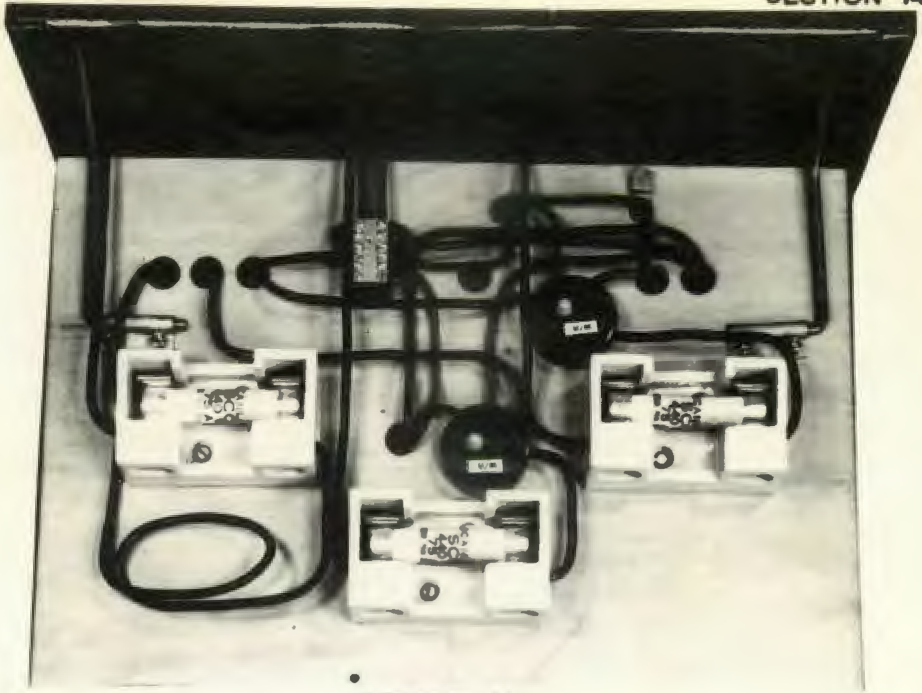


FIGURE 16.

HINGED SERVICE BOARD SHOWING CONNECTIONS FOR A THREE PHASE METER, A TWO PHASE METER AND 2 TIME SWITCHES.

NOTE: WITH SINGLE PHASE METER AND ONE TIME SWITCH, ONLY ONE LINK IS REQUIRED. (U/M LABELLING IS NOT ESSENTIAL IN THIS CASE)

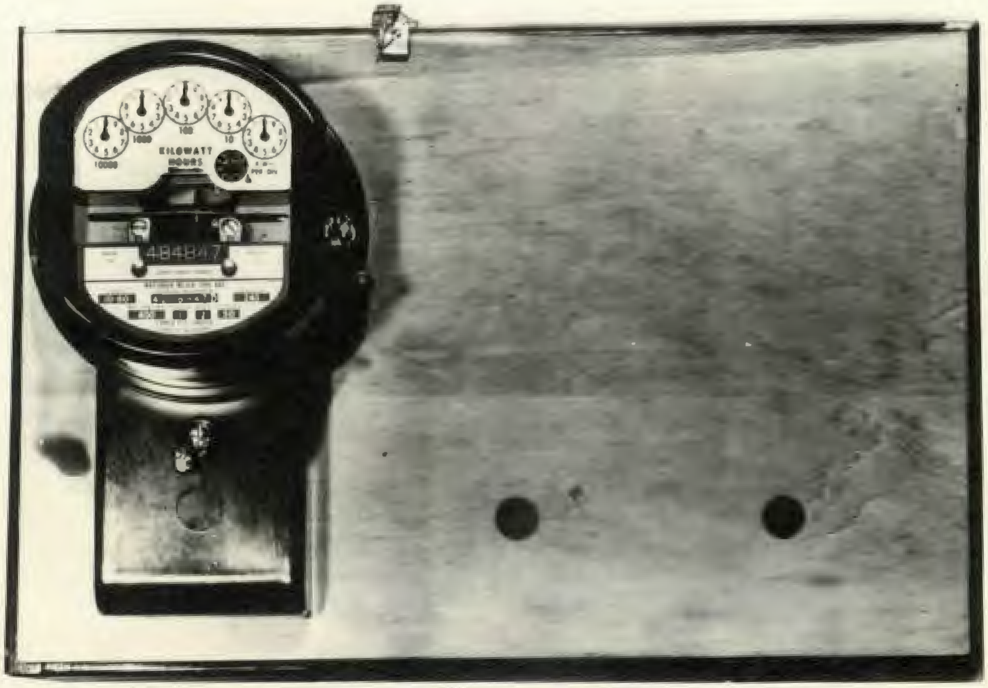


FIGURE 17.

HINGED SERVICE BOARD WITH A SINGLE PHASE DOMESTIC RATE METER

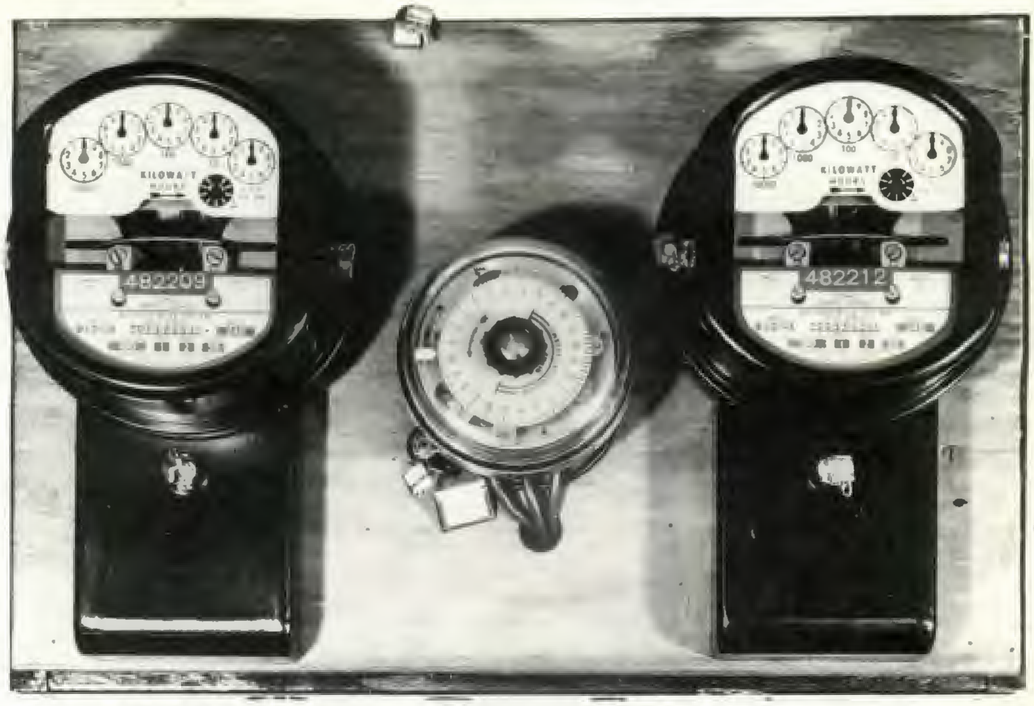


FIGURE 18

HINGED SERVICE BOARD WITH SINGLE PHASE DOMESTIC AND STORED HEAT RATE 'A' METERS AND TIME SWITCH

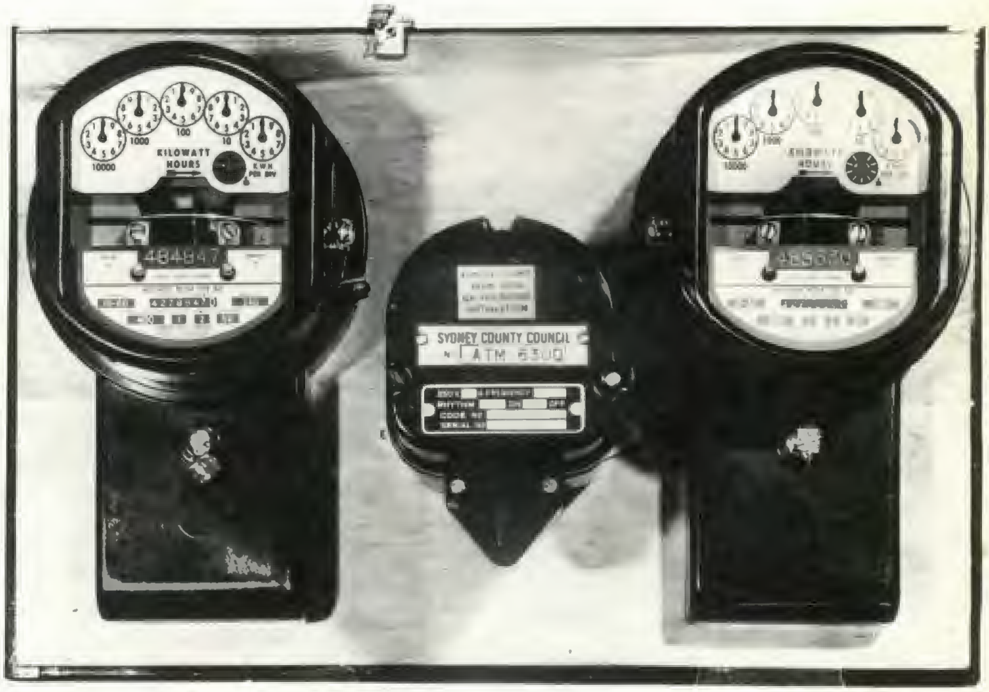


FIGURE 19

HINGED SERVICE BOARD WITH SINGLE PHASE DOMESTIC AND STORED HEAT RATE 'A' METERS AND A.T.M. TYPE RELAY

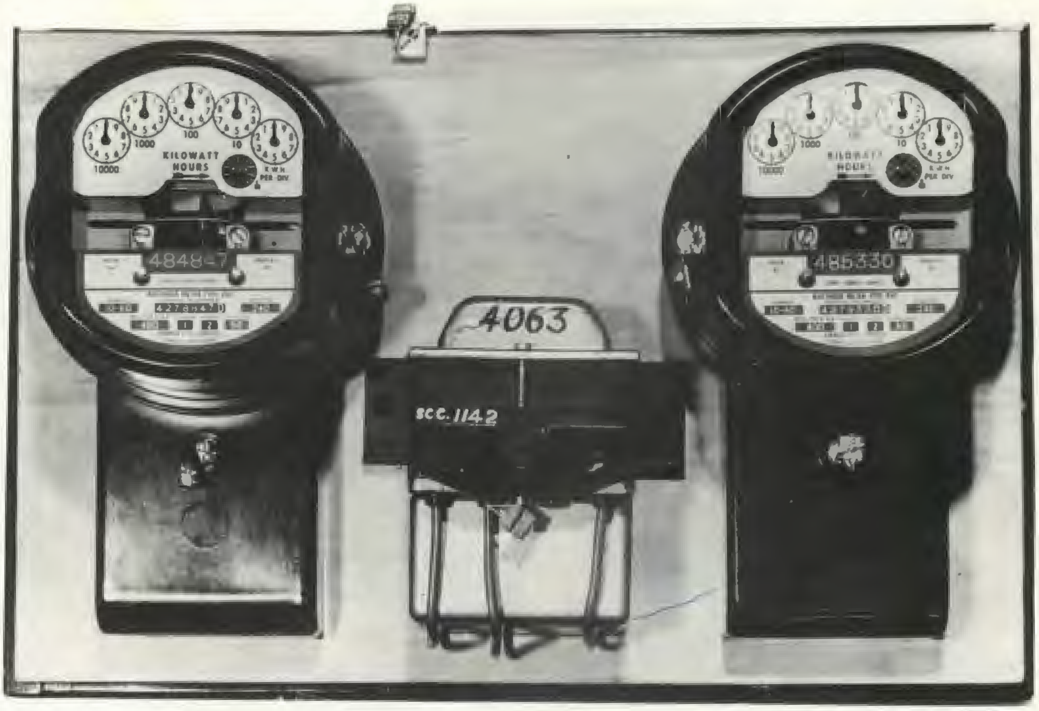


FIGURE 20

HINGED SERVICE BOARD WITH SINGLE PHASE DOMESTIC AND STORED HEAT RATE 'A' METERS AND D.C. BIAS RELAY

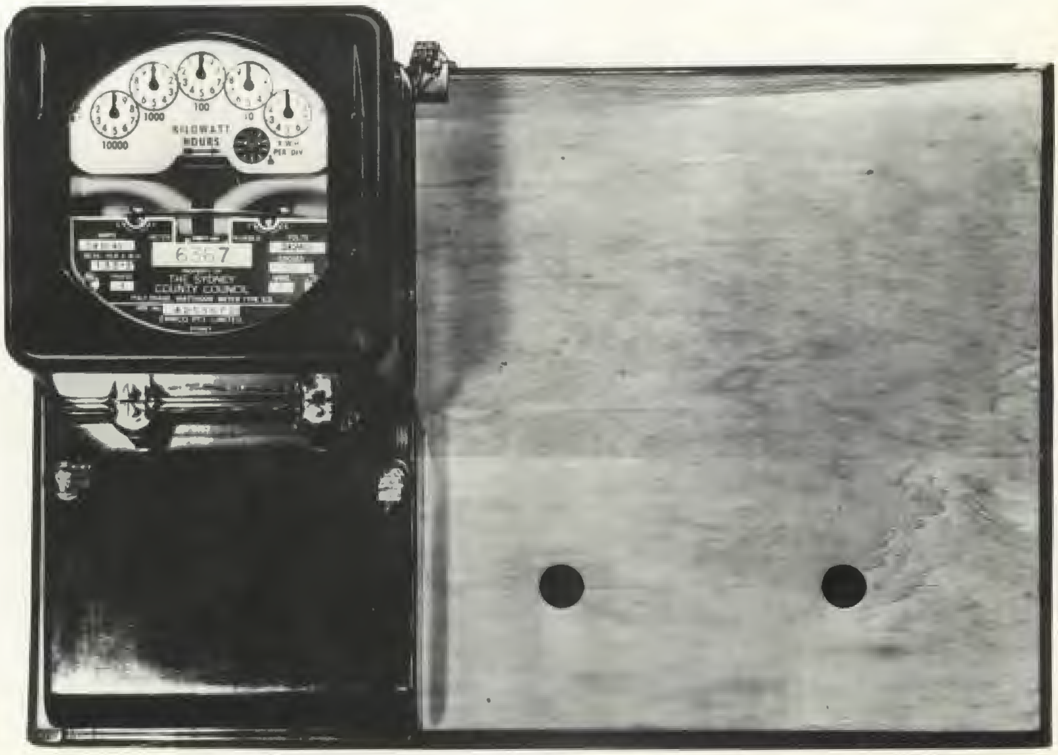


FIGURE 21

HINGED SERVICE BOARD WITH THREE PHASE DOMESTIC RATE METER

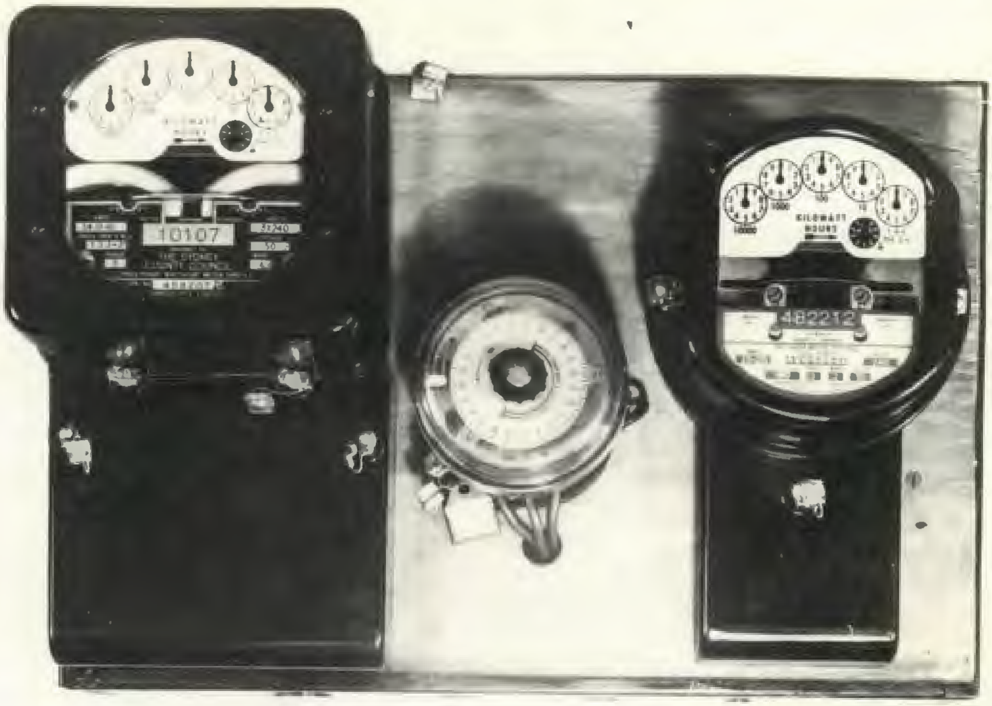


FIGURE 22

HINGED SERVICE BOARD WITH THREE PHASE DOMESTIC AND SINGLE PHASE STORED HEAT RATE 'A' METERS AND TIME SWITCH

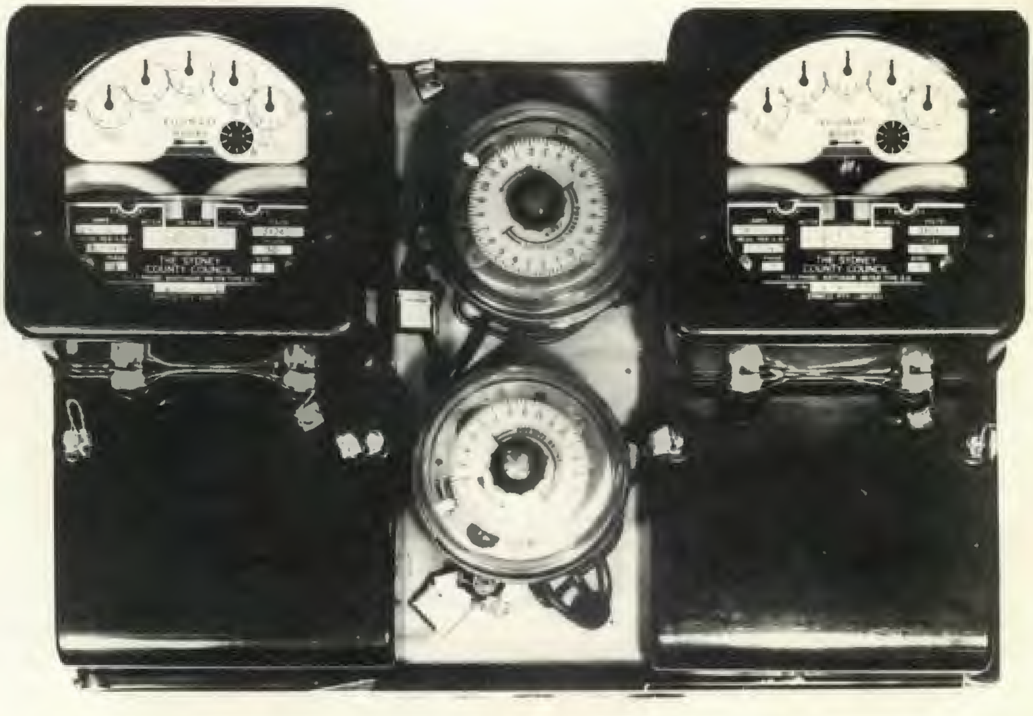


FIGURE 23

HINGED SERVICE BOARD WITH THREE PHASE DOMESTIC AND STORED HEAT RATE 'A' METERS AND TIME SWITCHES

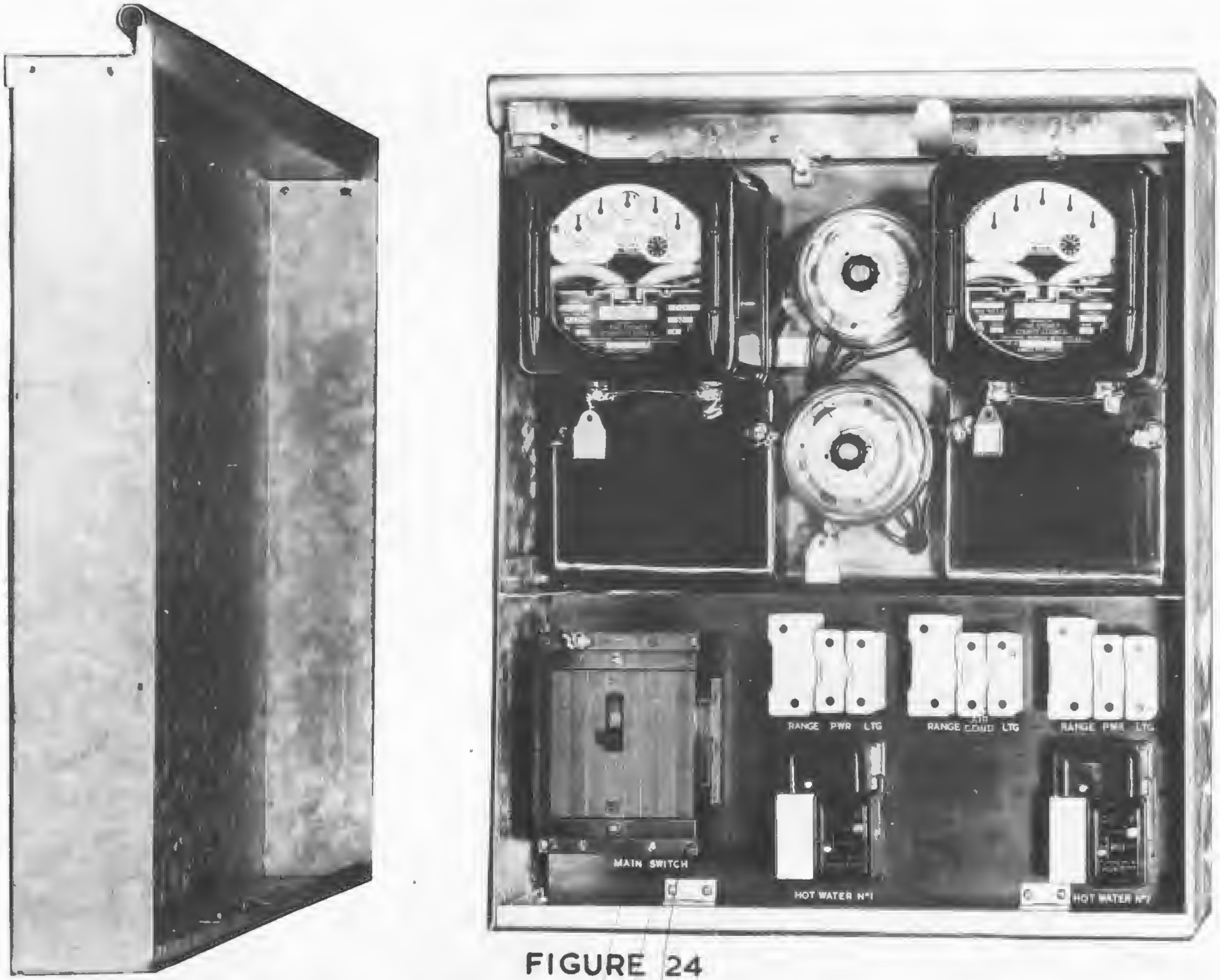


FIGURE 24

COMPACT SERVICE BOX AND HINGED SERVICE BOARD FOR SINGLE PRIVATE RESIDENCE

SECTION 15

TIME CONTROL OF INSTALLATIONS SUPPLIED DURING SPECIFIED HOURS, OTHER THAN NIGHT RATE

General Page 1

Table Showing Time Control Equipment to be used Page 2

Multi Customer Installations Page 3

Time Checks Page 3

Time Switch Numbers Page 3

TIME CONTROL OF INSTALLATIONS SUPPLIED DURING SPECIFIED HOURS, OTHER THAN NIGHT RATE

General

Where, in accordance with any rate published by the Council, electricity is supplied only during certain hours, the Council will, generally, provide time control equipment so that electricity to be charged for at the rate may be used only during the hours specified.

Under Service Rule 10 (d) the Council will provide time control equipment only up to a rating of 30 amperes per phase per customer. Where the load is in excess of this rating, the customer must provide and install an approved type of contactor suitable for control by a time switch or other time control equipment, provided by the Council.

For a contactor to be classed as "approved", it must be suitable in all respects for the control of the installation and for operation by the Council's normal time switch. It must be provided with facilities for sealing and all connections must be made within the sealed portion of the contactor. The operating coil of the contactor must be arranged for 240 volt operation. A 415 volt coil may only be used if the supply to it is controlled by a 240 volt relay which is suitable for connection to the Council's time switch. If the supply for the operating coil is unmetered, the contactor shall be of the "latching" type, i.e. the unmetered supply is applied to the operating coil or coils only momentarily whilst the contactor is in the process of being latched in or out. A "latching" type contactor should also be used where the hum or vibration of the hold in coil would be objectionable, i.e. residences, professional rooms, etc. However, it is not obligatory for a customer to provide a latching contactor in the latter case as it is for his convenience only.

Installations to be connected at any of these rates shall be metered with the appropriate size meter, (either whole current or C.T. metering) and controlled with time control equipment as shown in the following table, each instrument being connected in accordance with the appropriate instructions of this book.

Phases of Supply	Demand per Phase	Time Control Equipment	Remarks
1 phase	Not more than 15 amps.	One 15 amp. time switch.	See circuit diagram 3A, 3B and 4A, Section 25.
2 phases	Not more than 15 amps.	Two 15 amp. time switches	See circuit diagram 4B, Section 25
1, 2 or 3 phases	More than 15 amps. but not more than 30 amps.	One 15 amp. time switch and a IV C. type A.C.R.	See circuit diagram 5, Section 25 and figure 27, Section 7.
3 phases	Not more than 10 amps	One 15 amp. time switch and a III C. type A.C.R.	See circuit diagram 5, Section 25 and figure 27, Section 7.
3 phases	More than 10 amps but not more than 30 amps.	One 15 amp. time switch and a IV C. type A.C.R.	See circuit diagram 5, Section 25 and figure 27, Section 7.
1, 2 or 3 phases	More than 30 amps.	(a) One 15 amp. time switch if customer's contactor is "hold in" type.	See circuit diagram 7, Section 25.
		(b) One 15 amp. time switch and a VII type double throw A.C.R. if customer's contactor is "latching" type	See circuit diagram 30, Section 7.
		(c) One 15 amp. SSS. type time switch if customer's contactor is "latching" type and irregular switching is required, e.g. weekend supply at Restricted Hours Rate.	See circuit diagram 31, Section 7.

Note: The D.C. Bias Relay, the A.T.M. Rhythmatic Control Relay or other type of time control may be used in lieu of the 15 amp. time switch from time to time.

Multi Customer Installations

Each customer is entitled to time control equipment up to 30 amperes per phase and in multi customer installations the Council will for economic reasons connect several separately metered Stored Heat "A" installations through Auxiliary Control Relays, or a master latching type contactor.

The cost of a relay and one time switch is less than the cost of three or more time switches, and the resultant saving when a time switch and relay is installed, increases in proportion to the number of installations greater than two. Therefore, if the number of time switches required is greater than two, a time switch and an ACR of appropriate size shall be installed. For example, in a block of 12 home units, each with a 2.4 kW off peak water heater, (or a block of officers with thermal storage space heaters) a time switch and a 30 amp. IV C type A.C.R. shall be installed, three water heaters being connected to each of the four poles. As only one conductor may be connected to each relay terminal, the Council will provide and install links for the connection of the meters to the load terminals of the relay. See circuit diagram 6, Section 25.

The III C, 10 amp. Landis and Gyr type A.C.R. (silent type) shall not be installed by the Inspection Branch. They will be used for replacement of noisy relays in special situations only by the Meter Branch.

Time Checks

Upon every occasion that an officer carries out work at premises to which supply is controlled by a time switch, he shall check that it is set to the correct time of day and where day wheels are fitted to the correct day. Where the setting is found to be incorrect, it must be adjusted and resealed accordingly. In this regard the setting shall be deemed to be "correct" if it is within half an hour of the correct time of day.

Note: This does not apply to Night Rate time switches as an accurate setting is required at all times.

Time Switch Numbers

On some time switches the Council's number is shown on the name plate and also on the removeable cover. In an installation where more than one time switch is installed, care must be taken to ensure that each cover is replaced on the correct time switch.

SECTION 16

STORED HEAT RATE A.

Metering, General	Page 1
Control	Page 1
Tappet Settings	Page 2
Requisitioning of Time Switches	Page 2
Setting to Time of Day	Page 3
Manual Operation	Page 3

STORED HEAT RATE A.

(See B.S.I. No. 412, Index 462)

Metering, General.

The metering of Stored Heat Rate supply shall be made with single phase or polyphase meters without the use of Meter Connector Blocks in accordance with Section 10, "Whole Current Metering", or if C.T. metered, in accordance with Section 11, "C.T. Metering".

In single domestic installations the metering equipment shall be installed on the Hinged Service Board as shown in Section 14, "Service and Meter Boards". In other installations, they shall be mounted on any of the standard boards shown in the same Section.

Where the older type 18" x 12" wide board is installed, the meters and time switch must be mounted as shown in Section 10, figure 2.

Meters and time control equipment shall be connected as shown in Section 25, circuit diagrams 3A, 3B, 4A, 4B, 5, 6 or 7 as applicable, except that in some existing installations, the domestic neutral conductor may not be of sufficient length to reach the service neutral link on the re-arranged service board in which case it may then be connected to the Domestic Rate meter neutral terminal No. 3. Alternatively, it may be joined in a link on the board and connected to the service neutral link in the normal manner, or a new conductor may be installed from the customer's neutral link to the service link where it can be done easily.

Note: This is the only occasion where the customer's main neutral conductor may be connected to a meter. In all other instances the meter shall be connected as a "three wire" meter.

Control

The supply must be controlled with a time switch or other time control equipment in accordance with Section 15, "Time Control of Installations During Specified Hours, Other Than Night Rate".

Note: Where a customer has water heating and thermal storage space heating equipment both supplied at Stored Heat Rate "A", the Council will provide only one set of time control equipment. Any variation in switching times for any part of the equipment may be provided by the customer within his installation.

Where time switches are to be installed, a four terminal type, with or without day wheels as required, will be provided by the Meter Branch.

All equipment shall be installed in accordance with the instruction for the particular instrument in this Instruction Book.

Tappet Settings

(a) Off Peak Water Heating Installations

Time switch tappings will be set prior to issue in accordance with a programme for diversification which has been designed to give maximum relief to Distribution Centre loading within the hours of 8.00 p.m. and 8.00 a.m. For this purpose the switching times of the time switches have been staggered to switch in at hourly intervals.

The heating period for domestic installations in normally 7 hours, the "switching on" times being set at intervals between 8.00 p.m. and 1.00 a.m. the "switching off" times between 3.00 a.m. and 8.00 a.m.

Settings for less than 7 hours are not permitted. In cases where complaints of insufficient hot water are received, the heating period may be extended to 8 or 9 hours, but officers of the Inspection Branch must not alter settings unless instructed to do so. The heating period for other than domestic installations is 9 hours, the "switching on" time being set at intervals between 8.00 p.m. and 11.00 p.m. The "switching off" times between 5.00 a.m. and 8.00 a.m. For this purpose hospitals, doctor's and dentist's surgeries, hotels, residentials, institutions, boarding schools etc., shall be classed as other than domestic.

A supply of time switches set for the various switching times will be maintained and issued by the Meter Branch in rotation to ensure a satisfactory staggering of times.

(b) Thermal Storage Space Heating Equipment

To ensure satisfactory operation of thermal storage space heating equipment, a 9 hour heating period will be given from 10.00 p.m. to 7.00 a.m. and when supply is not required on Friday or Saturday nights, day wheels will be fitted to the time switches to omit either or both of these days.

The tappet settings of time switches shall not be altered by Inspection Branch officers unless specifically instructed to do so, except that where two time switches are installed for the one piece of equipment, the tappet settings must be identical. The settings must be checked and if necessary adjusted. A report of the alteration must be forwarded through the officer's supervisor to the Meter Superintendent.

Requisition of Time Switches

See B.S.I. No. 412 regarding the switching times required by the customer in some cases.

When ordering time switches, the remarks column of the requisition slip or the C.I.I. 126 form shall be marked as shown in the following table so that a time switch with the correct setting will be issued for the particular installation.

(a) Off Peak Water Heaters

No indication	Normal domestic installation, 7 hours heating
T.S. - 9 hours	Non-domestic installation, 9 hours heating.

(b) Thermal Storage Space Heating Equipment

T.S. Sp. Htg. A.	7 nights per week, each 10.00 p.m. ON, 7.00 a.m. OFF
T.S. Sp. Htg. A. O/S.	6 nights per week, each 10.00 p.m. ON, 7.00 a.m. OFF, omitting Saturday
T.S. Sp. Htg. A. O/FS	5 nights per week, each 10.00 p.m. ON, 7.00 a.m. OFF, Omitting Friday and Saturday.

The Metering Run sheet will be marked as shown above to indicate the installation to which a time switch with special heating periods is to be connected and care must be taken so that the correct time switch is installed on these installations. When special switching times are required, a label showing the times will be fixed to the dial or face of the time switch by the Meter Branch prior to issue.

When it is known that the time switch with the required setting is not readily available, an immediate telephone request must be made to the Meter Branch so that the time switch may be held in the Area Meter Branch store, tagged with the name and address of the job, until required.

Setting to The Time of Day

After connection, the time switch must be set to the correct time of day and the motor checked for rotation. See Section 7, "Control Equipment".

Manual Operation

If the installation is in order for connection and the premises are occupied, the time switch (or relay) shall be manually closed to give immediate supply. This applies to water heaters only.

SECTION 17

RESTRICTED HOURS RATE

Metering, General — Page 1

Control — Page 1

Tappet Settings — Page 1

Requisitioning of Time Switches — Page 1

Setting to Time of Day — Page 2

RESTRICTED HOURS RATE

(See B.S.I. No. 412, Index 462)

Metering, General

The metering of Restricted Hours Rate supply shall be made with single phase or polyphase meters without the use of Meter Connector Blocks in accordance with Section 10, "Whole Current Metering", or if C.T. metered, in accordance with Section 11, "C.T. Metering".

The meters and time control equipment shall be mounted on any of the standard boards detailed in Section 14, "Service and Meter Boards".

All equipment shall be installed in accordance with the instructions for the particular instrument in this Instruction Book and with circuit diagrams 5, 6 or 7 in Section 25 or 30 and 31 in Section 7 as applicable.

Control

The supply must be controlled with a time switch or other time control equipment in accordance with Section 15, "Time Control of Installations During Specified Hours, Other Than Night Rate".

The Meter Branch will provide either the SSA4, VS4, or SSS. type time switches, with or without day wheels as required, or other types as determined from time to time by the Meter Superintendent.

Time control equipment will not generally be installed for room heating equipment to which Church Rate applies providing a written undertaking is received from the customer agreeing to use supply only during the restricted hours as shown in the above B.S.I.

Tappet Settings

Time switch tappets will be set prior to issue for the switching times required by the customer and in accordance with the Schedule of Rates and with B.S.I. No. 412.

Tappet settings shall not be altered by Inspection Branch officers unless specifically instructed to do so, except that where two time switches are installed for the one piece of equipment, the tappet settings must be identical. The settings must be checked and if necessary, adjusted. A report of the alteration must be forwarded through the officer's supervisor to the Meter Superintendent.

Requisition of Time Switches

When ordering time switches, the remarks column of the requisition slip or the C.I.I. 126 form shall be marked as shown in the following table so that a time switch with the correct setting will be issued for the particular installation.

R. Hrs.	7 nights per week, each 1.00 p.m. ON, 7.00 a.m. OFF
R. Hrs. O/S.	6 nights per week, each 10.00 p.m. ON, 7.00 a.m. OFF, omitting Saturday
R. Hrs. O/FS	5 nights per week, each 10.00 p.m. ON, 7.00 a.m. OFF, omitting Friday and Saturday.
R. Hrs. W/E	7 nights per week, each 10.00 p.m. ON, 7.00 a.m. OFF, plus daytime weekend.

The time "6.30" must be added to the abbreviation where necessary to indicate that the time switch is to be set to switch on at 6.30 p.m. for heating premises supplied at Church Rate or for battery charging.

The Metering Run Sheet will be marked as shown above to indicate the installation to which a time switch with special heating periods is to be connected and care must be taken so that the correct time switch is installed on these installations. A label showing the switching times will be fixed to the dial or face of the time switch by the Meter Branch prior to issue.

When it is known that the time switch with the required setting is not readily available, an immediate telephone request must be made to the Meter Branch so that the time switch may be held in the Area Meter Branch store, tagged with the name and address of the job until required.

Setting to Time of Day

After connection, the time switch must be set to the correct time and to the correct day where day wheels are fitted, and the motor checked for rotation. See Section 7, "Control Equipment".

SECTION 18

NIGHT RATE, METAL MELTING OR OTHER TWO RATE TARIFFS

Metering, General Page 1

Control Page 1

Tappet Settings Page 1

Requisitioning of Time Switches Page 1

Setting to Time of Day Page 1

NIGHT RATE, METAL MELTING OR OTHER TWO RATE TARIFF

Metering, General

The metering of these rates shall be made with a single or polyphase meter in accordance with Section 10, "Whole Current Metering", or if C.T. metered, in accordance with Section 11, "C.T. Metering".

The meter and time control equipment shall be mounted on any of the standard boards detailed in Section 14, "Service and Meter Boards", and must be connected as shown in Section 25, circuit diagrams 10 to 15 as applicable.

> Note: An additional colour code (red/green) will be used where shown in diagrams. The cable marking under this code will take the form of 6 mm. plastic tubing in a similar manner to C.T. metering colour marking. (See Section 11).

Control

The two rate meter register relay will be controlled with a WF11 type spring reserve time switch or other types as determined from time to time by the Meter Superintendent.

Each time switch and meter shall be installed in accordance with the instructions for the particular instrument in this Instruction Book.

> Note: The active supply to the time switch must be protected by a fuse where shown in circuit diagrams 10 and 11 for C.T. Night Rate metering and where one time switch controls the relays for more than one whole current meter in circuit diagram 15. Protection is not required where only one whole current meter is installed.

Tappet Settings

Time Switch tappets will be set prior to issue in accordance with the hours specified in the Schedule of Rates and must not be altered by Inspection Branch officers unless specifically instructed to do so.

Requisitioning of Time Switches and Meters

Immediately it is known that Night Rate metering is required an immediate telephone request must be made to the Meter Branch so that the metering equipment may be held in the area meter store, tagged with the name and address of the job, until required.

Setting to Time of Day

After connection the time switch shall be checked for the correct time of day and the motor checked for rotation. Particular attention must be paid to the time setting as it need be only a few minutes slow to deprive the customer of the low tariff to which he is entitled, or vice versa, deprive the Council of revenue if the time switch is fast.

FIGURES ~~19~~ TO 20

RESERVED FOR FUTURE USE

METERING INSTRUCTION BOOK - SECTION 25
Superseding Introductory Page 1 dated 30.4.64.

CIRCUIT DIAGRAMS

	Circuit Diagram
Typical Single Meter Installation	1
Typical Three Meter Installation with M.D.I.s if required.	2
50 amp. Single Phase Service, Principal Rate & Rate A Metering - Separate Main Switches	3A
Principal Rate and Rate A Metering - Master Main Switch	3B
50 amp. Multi-Phase Service, 2 Phase Principal Rate & Single Phase Rate A Metering - Master Main Switch	4A
3 Phase Principal Rate & 2 Phase Rate A Metering - Master Main Switch	4B
Control of 3 Phase Restricted Hours or Stored Heat Load for Single Customer with Time Switch & Relay	5
Control of 3 Phase Restricted Hours or Stored Heat Load for Multi-customers with Time Switch & Relay	6
Control of Customer's "hold-in" type contactor	7
C.T. Metering with 3 phase, S.D. Type meter and M.D.I.s if required	8
C.T. Metering with 3 Single Phase Meters and M.D.I.s if required	9
Reserved for future use	10-14
C.T. Metering with 3 Phase, SD/2R. Type Meter	15
Direct Connected Metering with 3 Phase, SD/2R. Type Meter	16
Direct Connected Metering with 2 Phase, SD/2R. Type Meter	17

Direct Connected Metering with Single Phase LG/CL.2R Type Meter 18

Direct Connected Metering with Three Single Phase, LG/CL.2R Type Meters 19

C.T. Metering with 3 phase, LG/ML.2R or ML/2R Type Meters 20

C.T. Metering with 3 phase, LG/2R or MG/2R Type Meters 21

Direct Connected Metering with 3 Phase, LG/2R Type Meter 22

Direct Connected Metering with 3 Phase, LG/ML.2R Type Meter 23

Direct Connected Metering with 3 Phase, LG/ML.ED Type, 3 x 10/40 Amp. Meter 24A

Direct Connected Metering with 3 Phase, LG/ML.ED Type, 3 x 15/100 Amp. Meter 24B

Direct Connected Metering with 3 Phase LG/ML.ED.2R Type, 3 x 20/80 Amp. or 3 x 15/100 Amp. Meter 25A

Direct Connected Metering with 3 Phase, LG/ML.ED. 2R Type, 3 x 10/40 Amp. Meter 25B

C.T. Metering with 3 Phase, LG/ED or SS/ED Type Meters 26

C.T. Metering with 3 Phase, LG/ML.ED (electrical reset) or LG/ML.ED Type Meters 27

C.T. Metering with 3 Phase, SS/ED.2R Type Meter 28

C.T. Metering with 3 Phase, LG/ED.2R Type Meter 29

C.T. Metering with 3 Phase, LG/ED (modified 2R) Type Meter 29A

C.T. Metering with 3 Phase, LG/ML.ED.2R Type Meter 30

C.T. Metering with 3 Phase, LG/ML.ED (modified 2R) Type Meter 30A

C.T. Metering with 3 Phase, LG/ML.ED.2R (electrical reset) Type Meter 31

C.T. Metering with 3 Phase, LG/ML.ED (modified 2R; electrical reset) Type Meter 31A

METERING INSTRUCTION BOOK - SECTION 25
Superseding Introductory Page 2 - dated 1.10.68

E.I.S./BL/MP
Ext. 4721

400.8

ELECTRICAL INSTALLATION BRANCH

24th October, 1968.

TO: HOLDERS OF METERING INSTRUCTION BOOKS

Additional LG/ML.ED.2R type C.T. connected meters are now available and the connections are as shown on the attached circuit diagram 30. A number of these instruments has also been converted for single rate use by having one register blanked out and the internal connections modified. The connections for this meter are as shown on the attached circuit diagram 31.

It will be noted that both of these meters have been given the same type identification (LG/ML.ED.2R) as the C.T. connected meter shown in circuit diagram 29, however, the new meters may be distinguished from the other by the card fixed to the front of the meter case indicating that the meter has an electrical reset and internal timing. In addition, the meter which has been converted for single rate use is recognised by the blanking out piece which has been screwed over one of the registers and by the test card being marked in red "converted to single rate use".

The words "internal timing" indicate that the 30 minute demand interval or integrating period is controlled by an inbuilt synchronous motor. Because of this a normal spring reserve type time switch is all that is required to control the 2 rate register as shown in diagram 30. With earlier types of LG meters, the demand interval is controlled by an LG.2R.D type time switch.

The words "electrical reset" indicate that the demand reset procedure is performed electrically rather than mechanically as in other LG. type meters. Similar to the Siemens Schuckert meter, a reset can only be performed if the meter is energised. The reset mechanism is operated by turning the reset key approximately a quarter of a turn.

The attached index page and circuit diagrams for the new instruments must be inserted in the appropriate places in Section 25 of the Metering Instruction Book.

SUPERVISOR METERING

Attach./

FIGURES 10 TO ~~14~~ 31a.

RESERVED FOR FUTURE USE

CIRCUIT DIAGRAMS

	Circuit Diagram
Typical Single Meter Installation	1
Typical Three Meter Installation with M.D.I.s if required.	2
50 amp. Single Phase Service, Principal Rate and Rate A Metering - Separate Main Switches.	3A
Principal Rate and Rate A Metering - Master Main Switch.	3B
Principal Rate and Controlled Load Metering - Separate Main Switch	3C
Principal Rate and Controlled Load Metering - With Master Main Switch.	3D
Controlled Load - Multi Customer Installation with ZEQ 22/1 and ZE 22/3 Frequency Injection Relays	3E
50 amp. Multi Phase Service, 2 Phase Principal Rate and Single Phase Rate A Metering - Master Main Switch.	4A
3 Phase Principal Rate and 2 Phase Rate A Metering - Master Main Switch	4B
Control of 3 Phase Restricted Hours or Stored Heat Load for Single Customer with Time Switch and Relay.	5
Control of 3 Phase Restricted Hours or Stored Heat Load for Multi Customers with Time Switch and Relay.	6
Frequency Injection Relay and Type IV C. ACR Control of Multi Customer Controlled Load	6A
Control of Customer's "hold-in" Type Contactor.	7

C.T. Metering with 3 Phase, S.D. Type Meter and M.D.I.s if required 8

C.T. Metering with 3 Single Phase Meters and M.D.I.s if required 9

Reserved for future use 10-14

C.T. Metering with 3 Phase, SD/2R Type Meter 15

Direct Connected Metering with 3 Phase, SD/2R Type Meter 16

Direct Connected Metering with 2 Phase, SD/2R Type Meter. 17

Direct Connected Metering with Single Phase LG/CL.2R Type Meter 18

Direct Connected Metering with Three Single Phase, LG/CL.2R Type Meters 19

C.T. Metering with 3 Phase, LG/ML.2R or ML/2R Type Meters 20

C.T. Metering with 3 Phase, LG/2R or MG/2R Type Meters 21

Direct Connected Metering with 3 Phase, LG/2R Type Meter 22

Direct Connected Metering with 3 Phase, LG/ML.2R Type Meter 23

Direct Connected Metering with 3 Phase, LG/ML.ED Type, 3 x 10/40 Amp. Meter 24A

Direct Connected Metering with 3 Phase, LG/ML.ED Type, 3 x 15/100 Amp Meter 24B

Direct Connected Metering with 3 Phase LG/ML.ED.2R Type, 3 x 20/80 Amp. or 3 x 15/100 Amp. Meter 25A

Direct Connected Metering with 3 Phase, LG/ML.ED.2R Type, 3 x 10/40 Amp. Meter 25B

C.T. Metering with 3 Phase, LG/ED or SS/ED Type Meters 26

C.T. Metering with 3 Phase, LG/ML.ED (electrical reset) or LG/ML.ED Type Meters 27

C.T. Metering with 3 Phase, SS/ED.2R Type Meter 28

C.T. Metering with 3 Phase, LG/ED.2R Type Meter 29

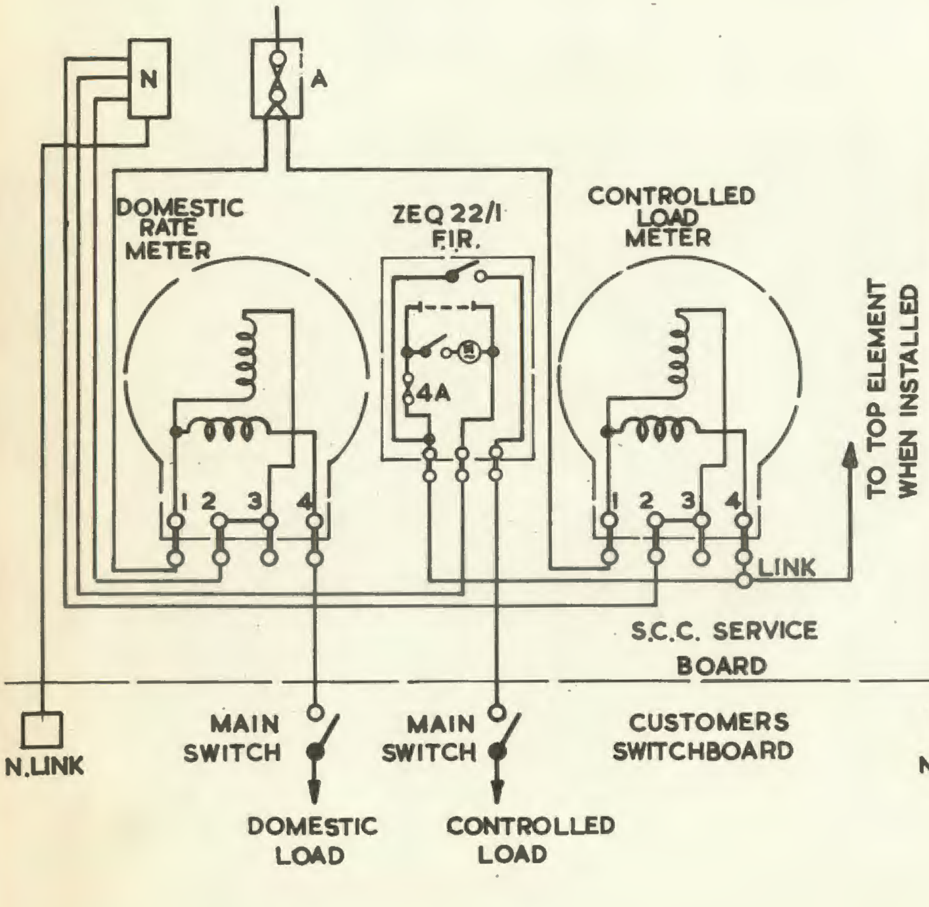
C.T. Metering with 3 Phase, LG/ED (modified 2R) Type Meter 29A

C.T. Metering with 3 Phase, LG/ML.ED.2R Type Meter 30

C.T. Metering with 3 Phase, LG/ML.ED (modified 2R) Type Meter 30A

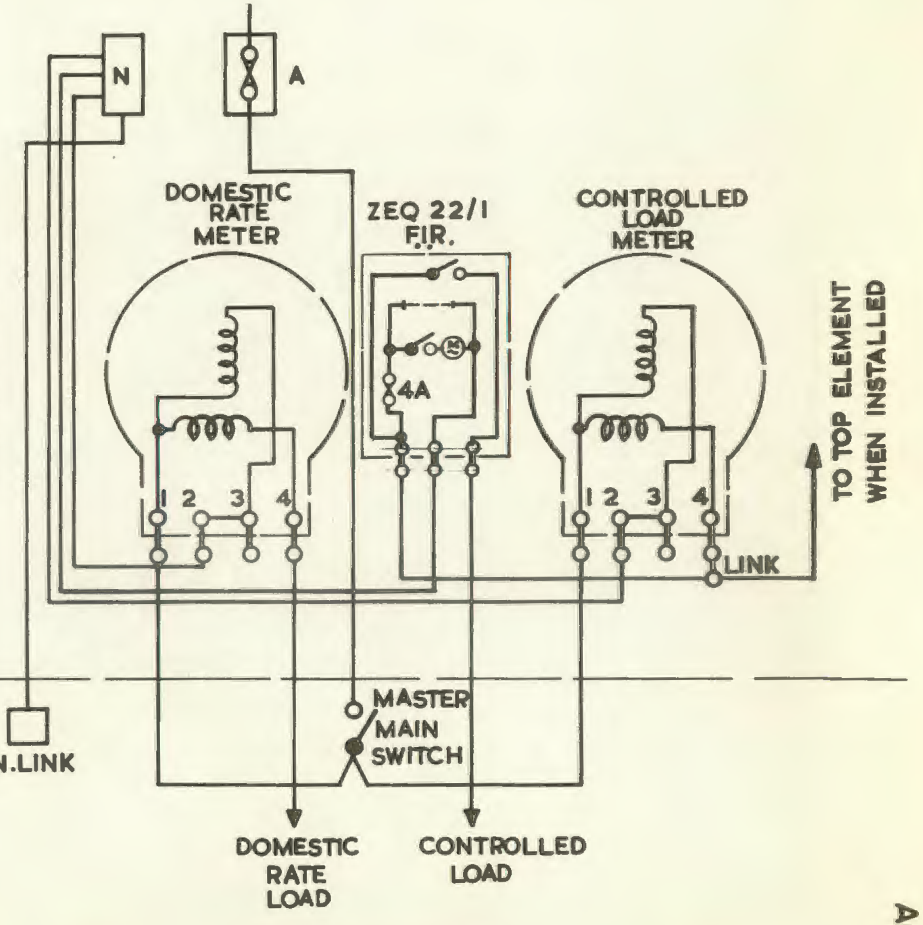
C.T. Metering with 3 Phase, LG/ML.ED.2R (electrical reset) Type Meter 31

C.T. Metering with 3 Phase, LG/ML.ED (modified 2R; electrical reset) Type Meter 31A



CIRCUIT DIAGRAM 3C

PRINCIPAL RATE AND CONTROLLED LOAD METERING
SEPARATE MAIN SWITCHES

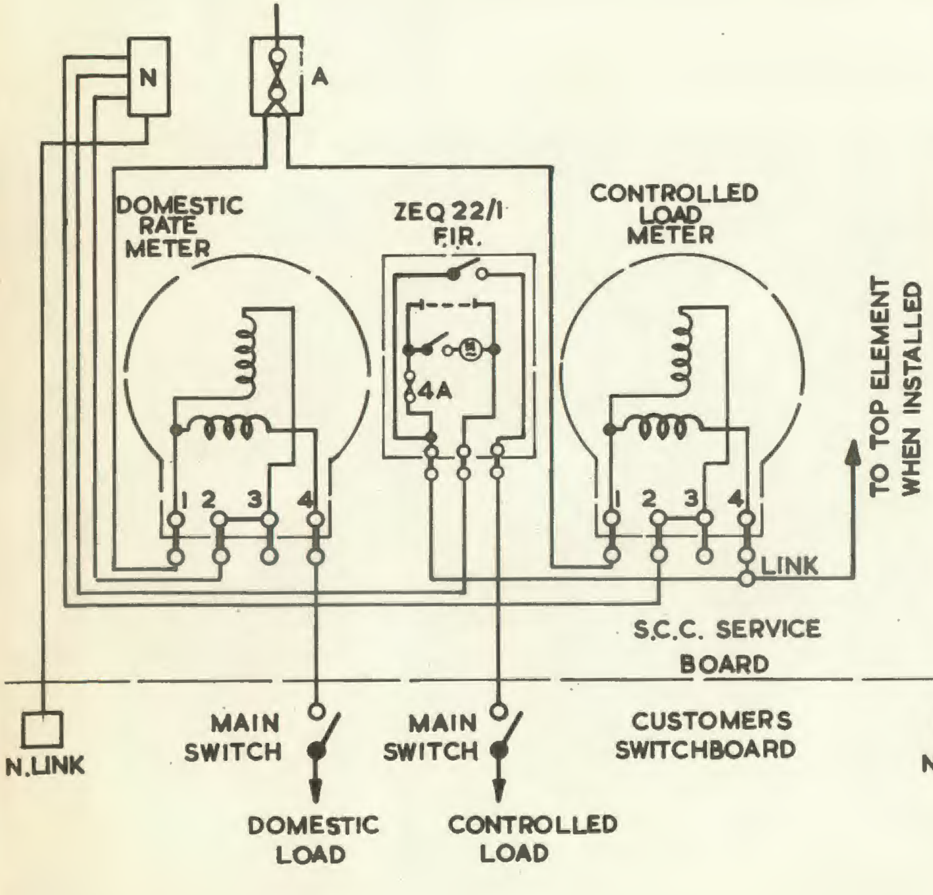


CIRCUIT DIAGRAM 3D

PRINCIPAL RATE AND CONTROLLED LOAD METERING
WITH MASTER MAIN SWITCH

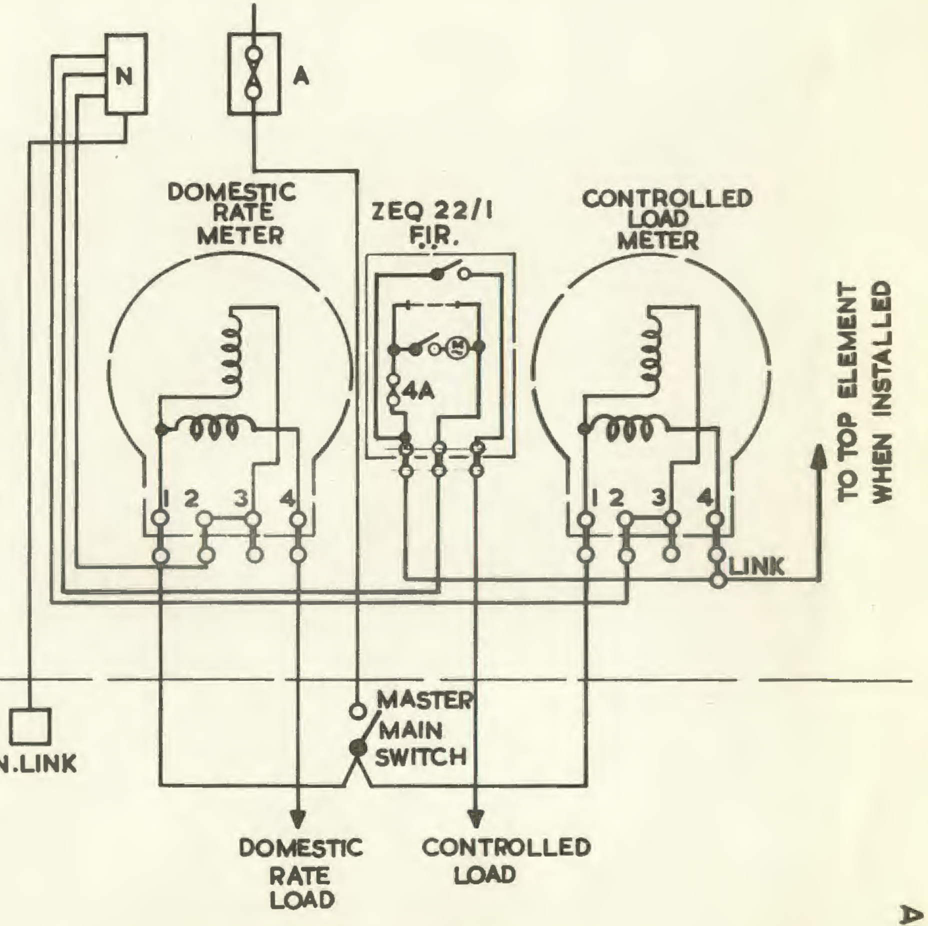
NOTE: FOR 2 OR 3 PHASE SUPPLY THE SAME PRINCIPLE APPLIES FOR EACH PHASE CONDUCTOR

A.C. 240V SINGLE PHASE SERVICE



CIRCUIT DIAGRAM 3C

PRINCIPAL RATE AND CONTROLLED LOAD METERING
SEPARATE MAIN SWITCHES

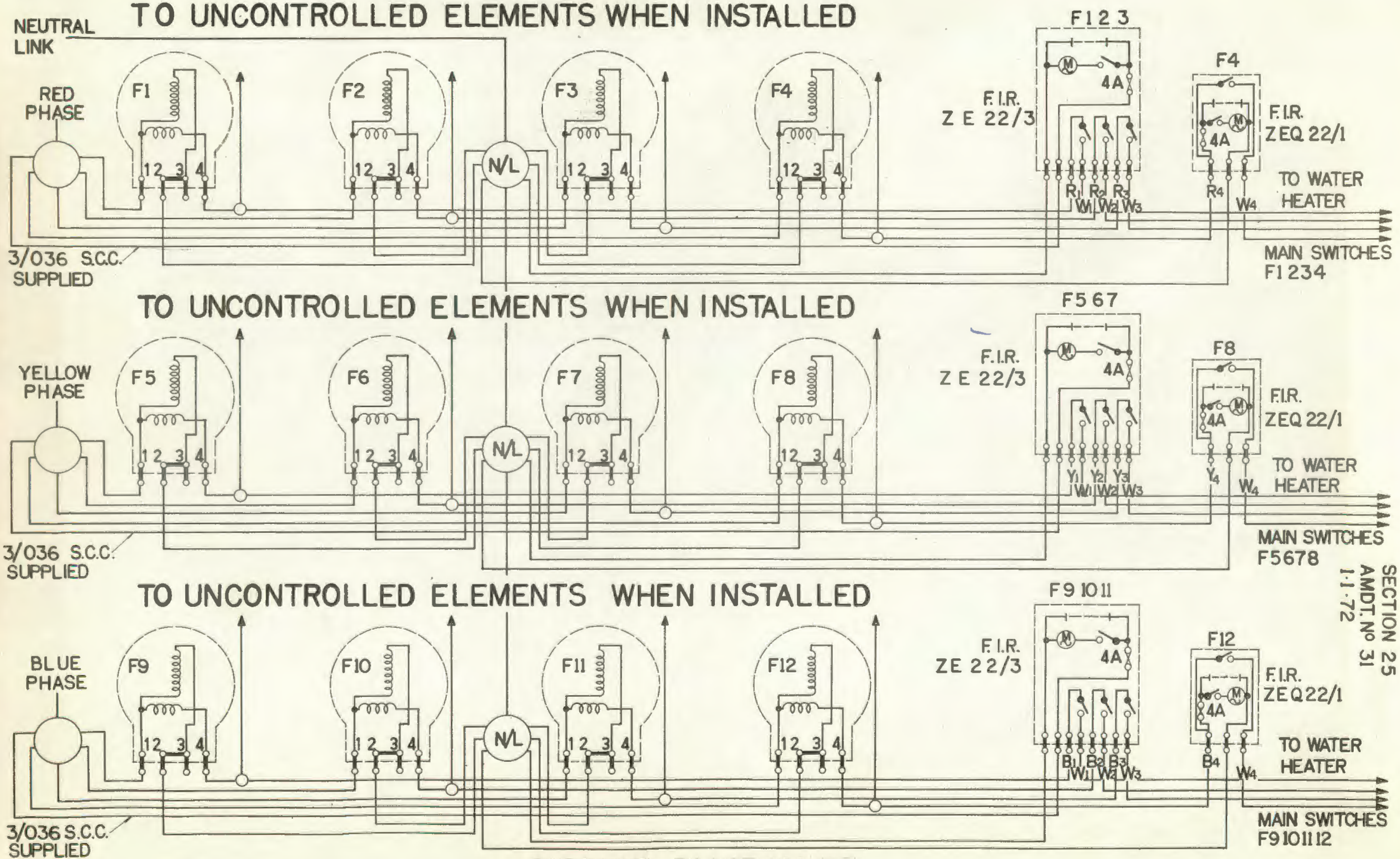


CIRCUIT DIAGRAM 3D

PRINCIPAL RATE AND CONTROLLED LOAD METERING
WITH MASTER MAIN SWITCH

NOTE: FOR 2 OR 3 PHASE SUPPLY THE SAME PRINCIPLE APPLIES FOR EACH PHASE CONDUCTOR

A.C. 240V SINGLE PHASE SERVICE



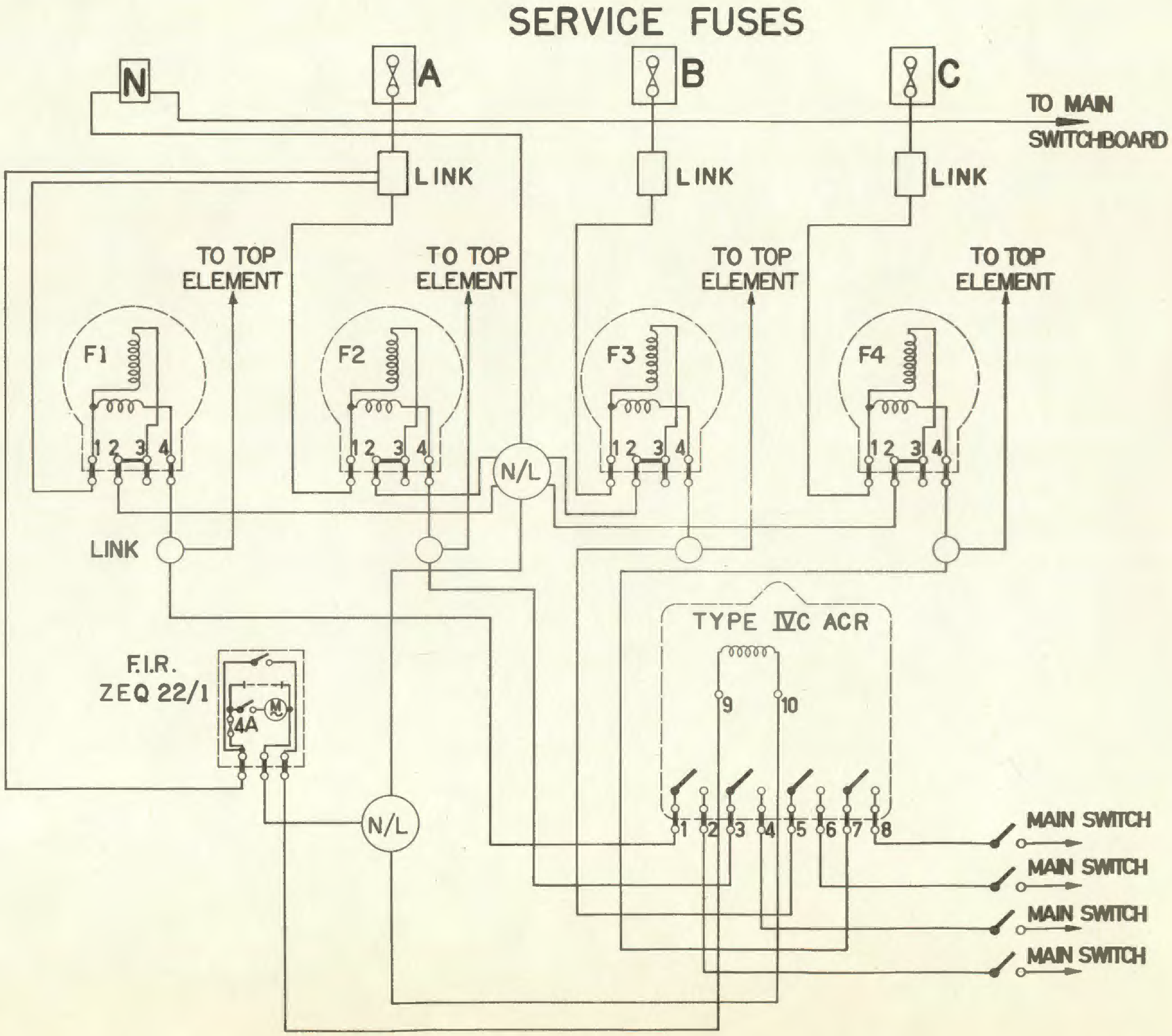
SECTION 25
AMDT. No 31
1·1·72

CODE

R= RED Y= YELLOW
B= BLUE W= WHITE

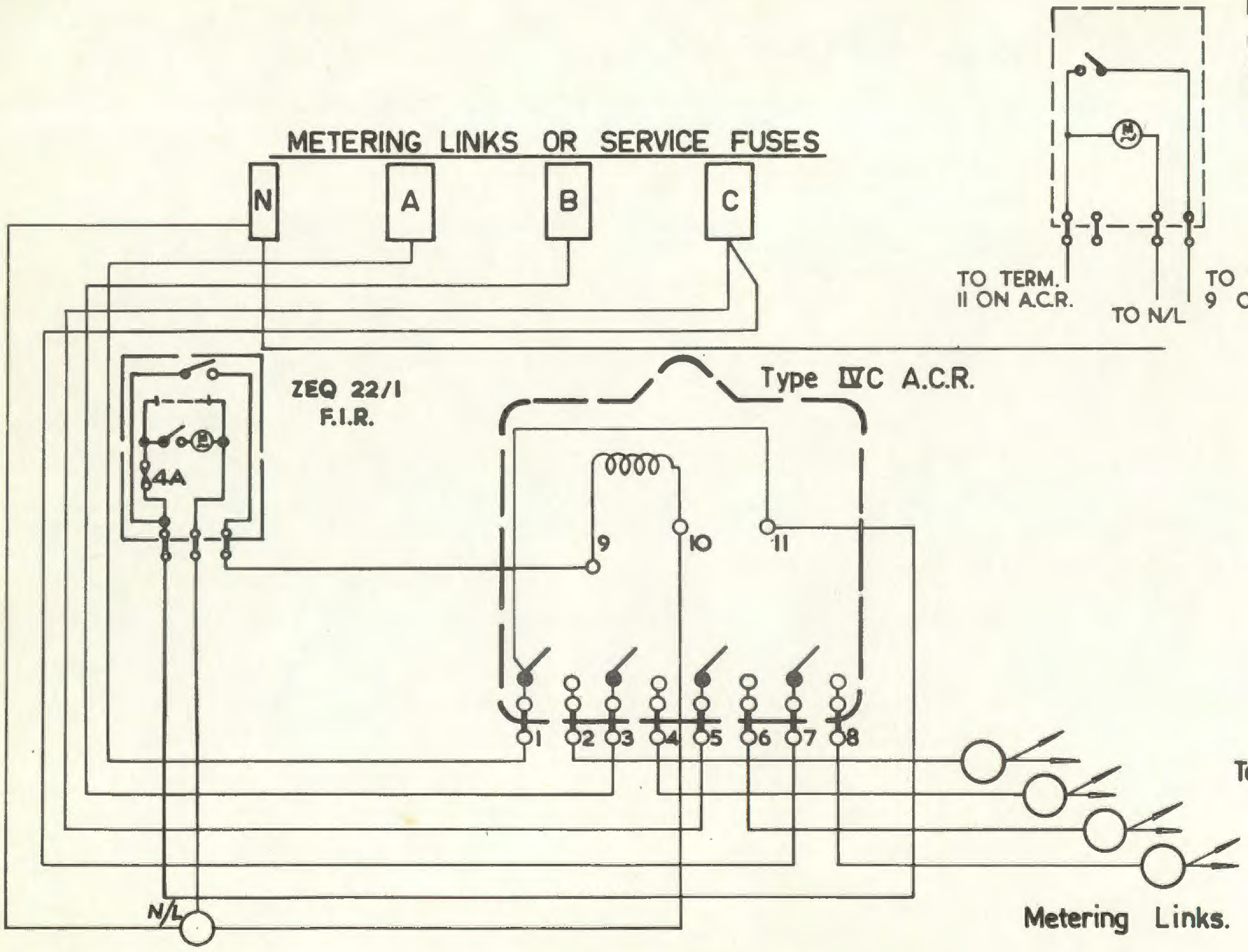
CIRCUIT DIAGRAM 3E

CONTROLLED LOAD MULTI CUSTOMER INSTALLATIONS
WITH ZEQ 22/1 AND ZE 22/3 FREQUENCY INJECTION RELAYS



CIRCUIT DIAGRAM 6A

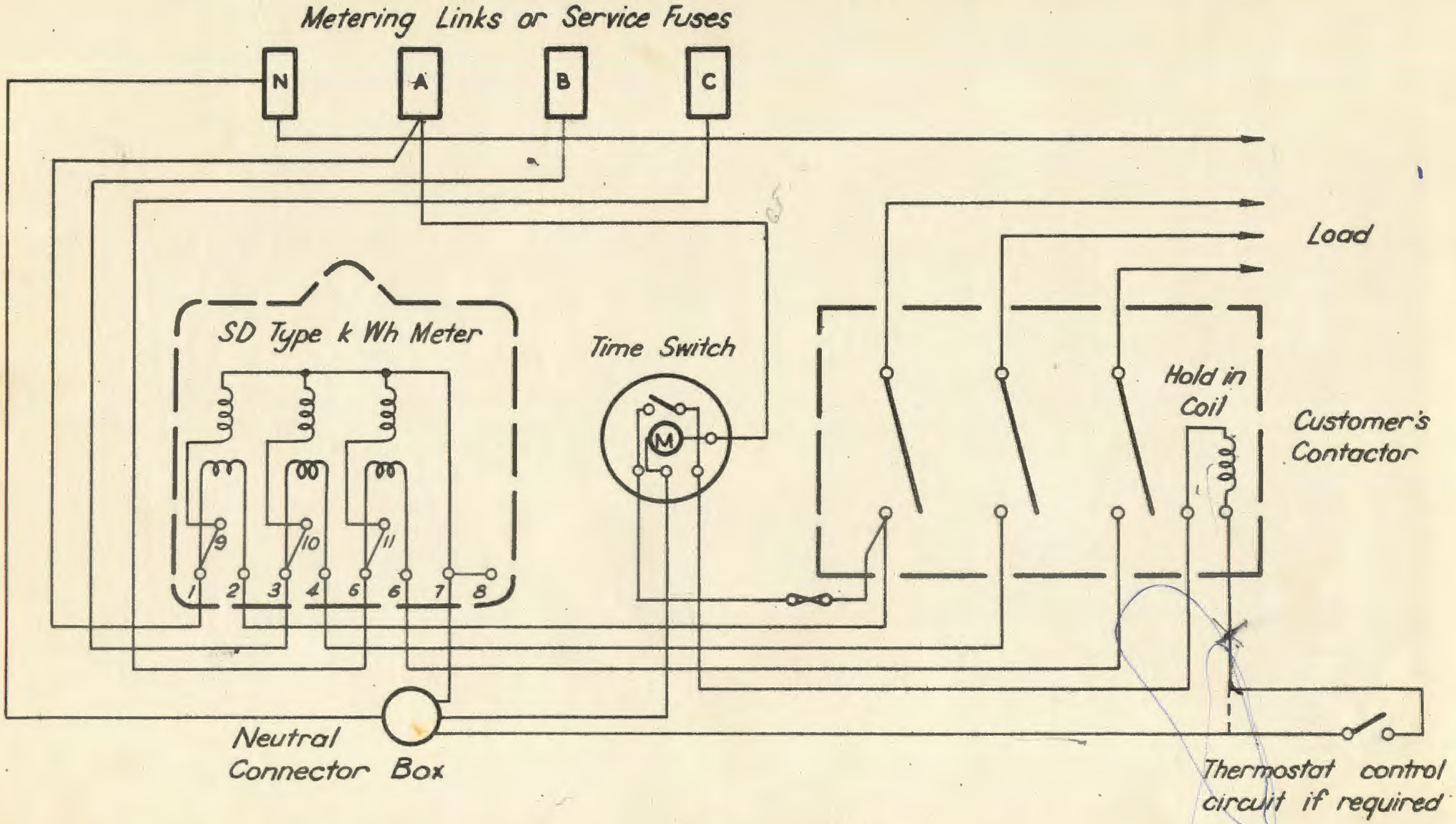
FREQUENCY INJECTION RELAY & TYPE IVC ACR CONTROL
OF MULTI CUSTOMERS CONTROLLED LOAD



Note:- If required use WF11 Time Switch

CIRCUIT DIAGRAM 6

FREQUENCY INJECTION RELAY AND TYPE IVC A.C.R. CONTROL OF MULTI CUSTOMER CONTROLLED LOAD



CIRCUIT DIAGRAM 7

CONTROL OF CUSTOMER'S "HOLD IN" TYPE CONTACTOR

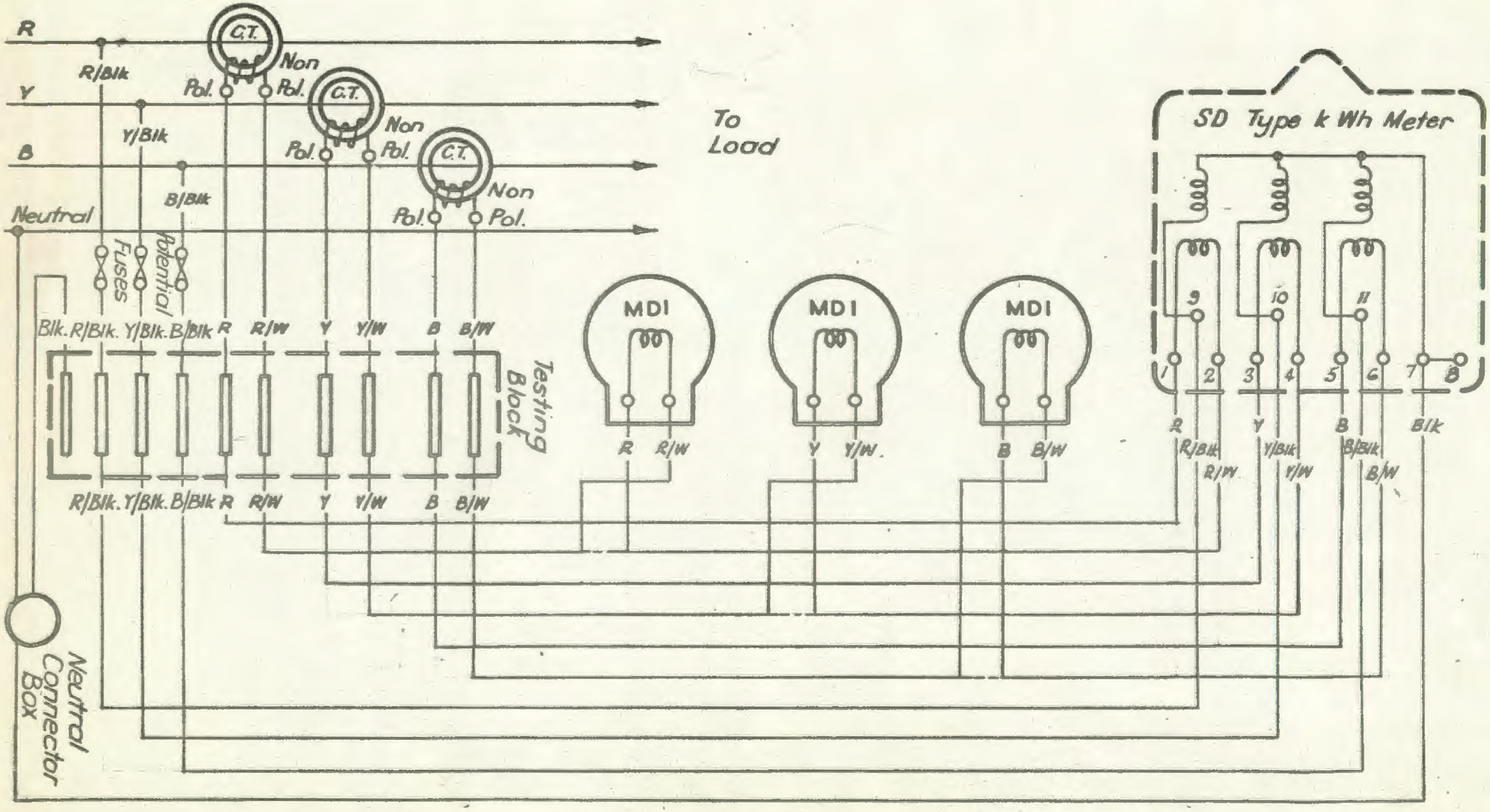
SEE ALSO SECTION 7 - FIGURES 30 AND 31 "LATCHING" TYPE CONTACTORS

NOTE: TIME SWITCH LINE AND LOAD CONDUCTORS SUPPLIED BY CUSTOMER WHEN C.T. METERING IS USED THE SUPPLY TO THE TIME SWITCH MOTOR IS SIMILAR TO THAT IN CIRCUIT DIAGRAM 11

SECTION 25.

(AMDT. No. 9 8·2·65)

METERING INSTRUCTION BOOK
SUPERSEDING EXISTING DIAGRAM No.8



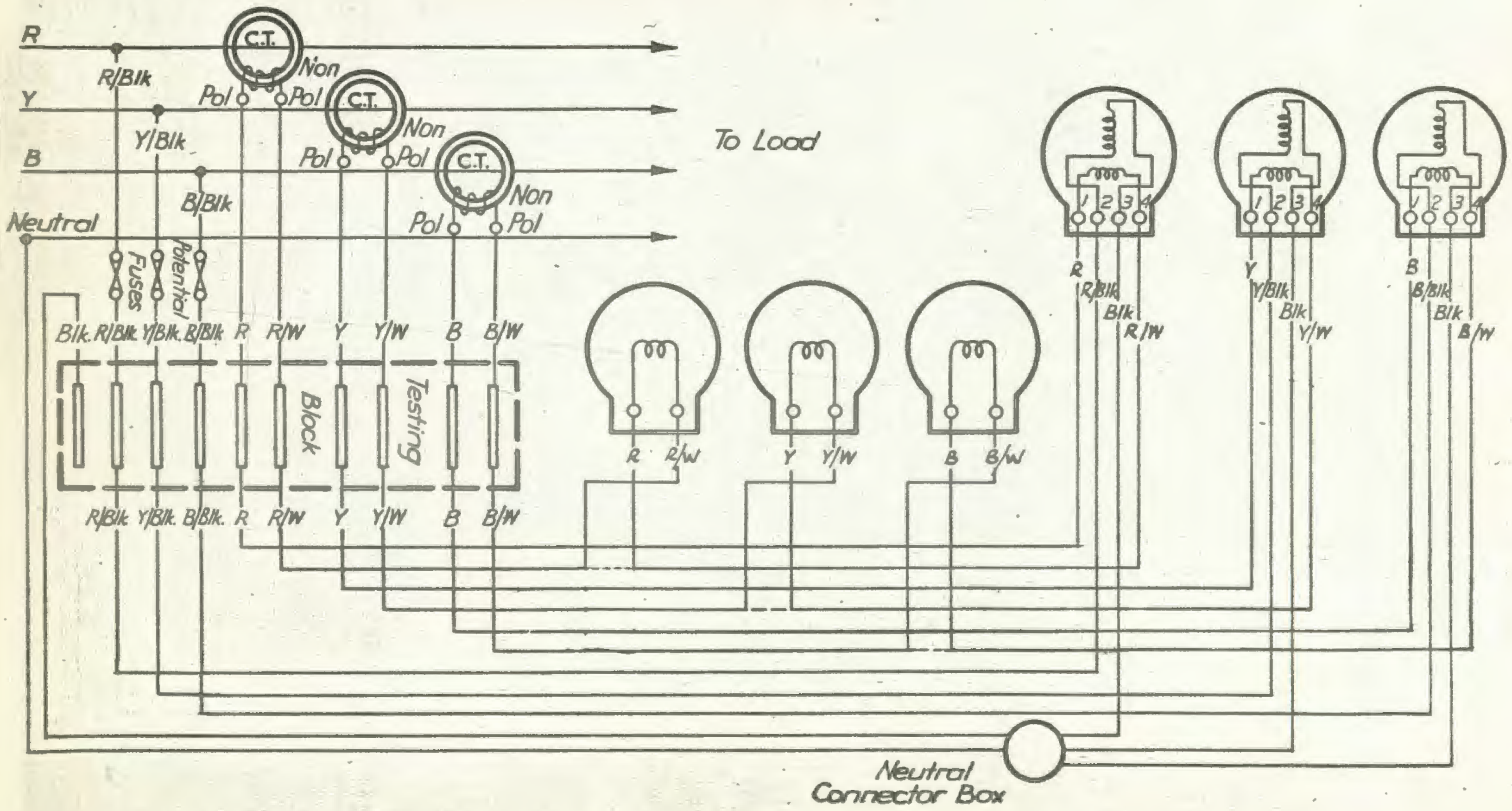
CIRCUIT DIAGRAM B

CURRENT TRANSFORMER METERING WITH SD TYPE POLYPHASE METER AND MAXIMUM DEMAND INDICATORS

NOTE: WHERE M.D.I.'S ARE NOT REQUIRED THE R/W, Y/W AND B/W CONDUCTORS REMAIN CONTINUOUS

CODE
R : RED
Y : YELLOW
B : BLUE
BLK: BLACK
W : WHITE

METERING INSTRUCTION BOOK
SUPERSEDING EXISTING DIAGRAM No. 9



CIRCUIT DIAGRAM 9

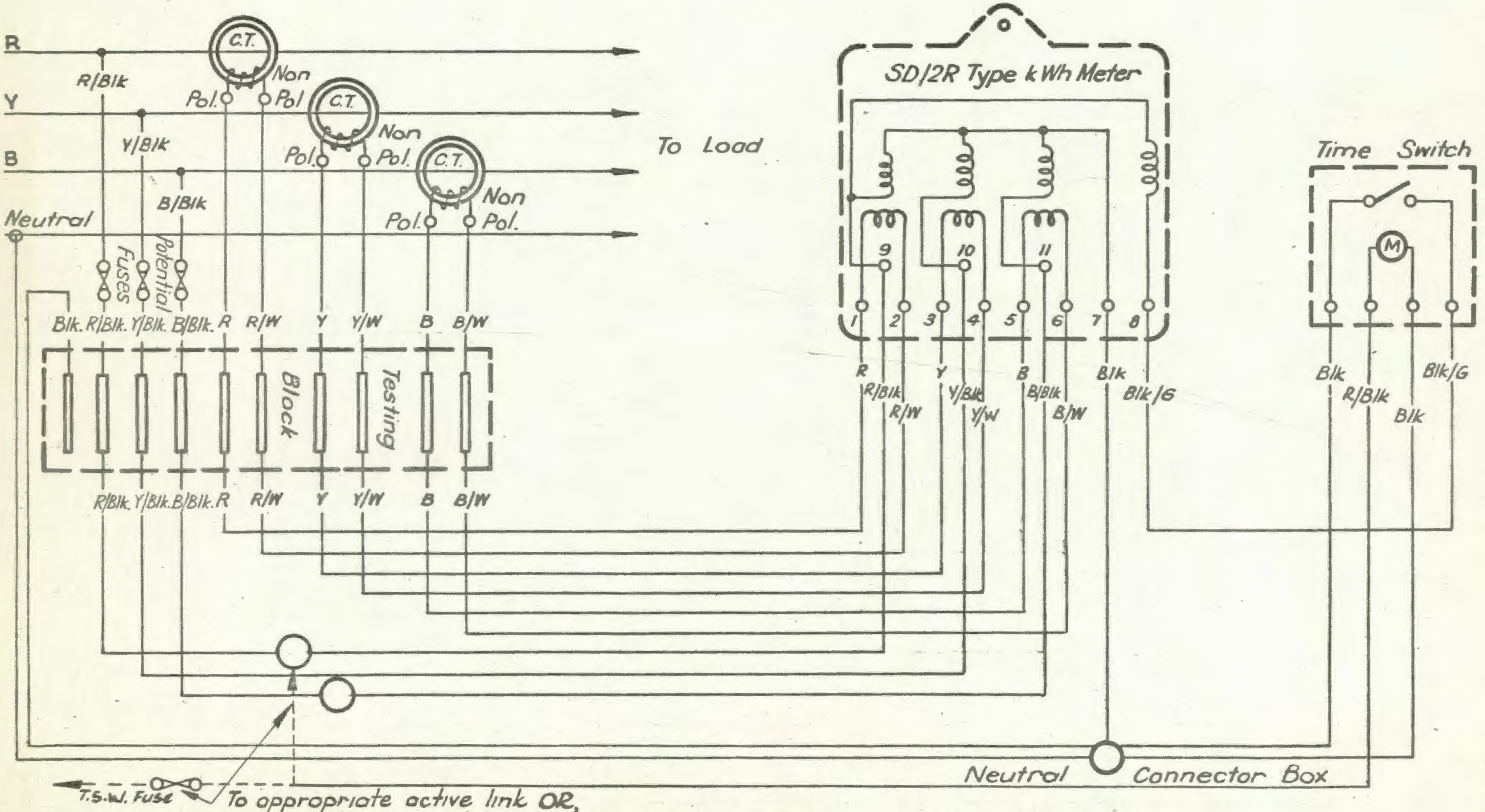
CURRENT TRANSFORMER METERING WITH SINGLE PHASE METERS
AND MAXIMUM DEMAND INDICATORS

NOTE: WHERE M.D.I.S ARE NOT REQUIRED THE R/W, Y/W, AND B/W
CONDUCTORS REMAIN CONTINUOUS

CODE
R : RED
Y : YELLOW
B : BLUE
BLK : BLACK
W : WHITE

SECTION 25
(Amdt. No. 23 1.7.69)

SUPERSEDING EXISTING DIAGRAM No. 15



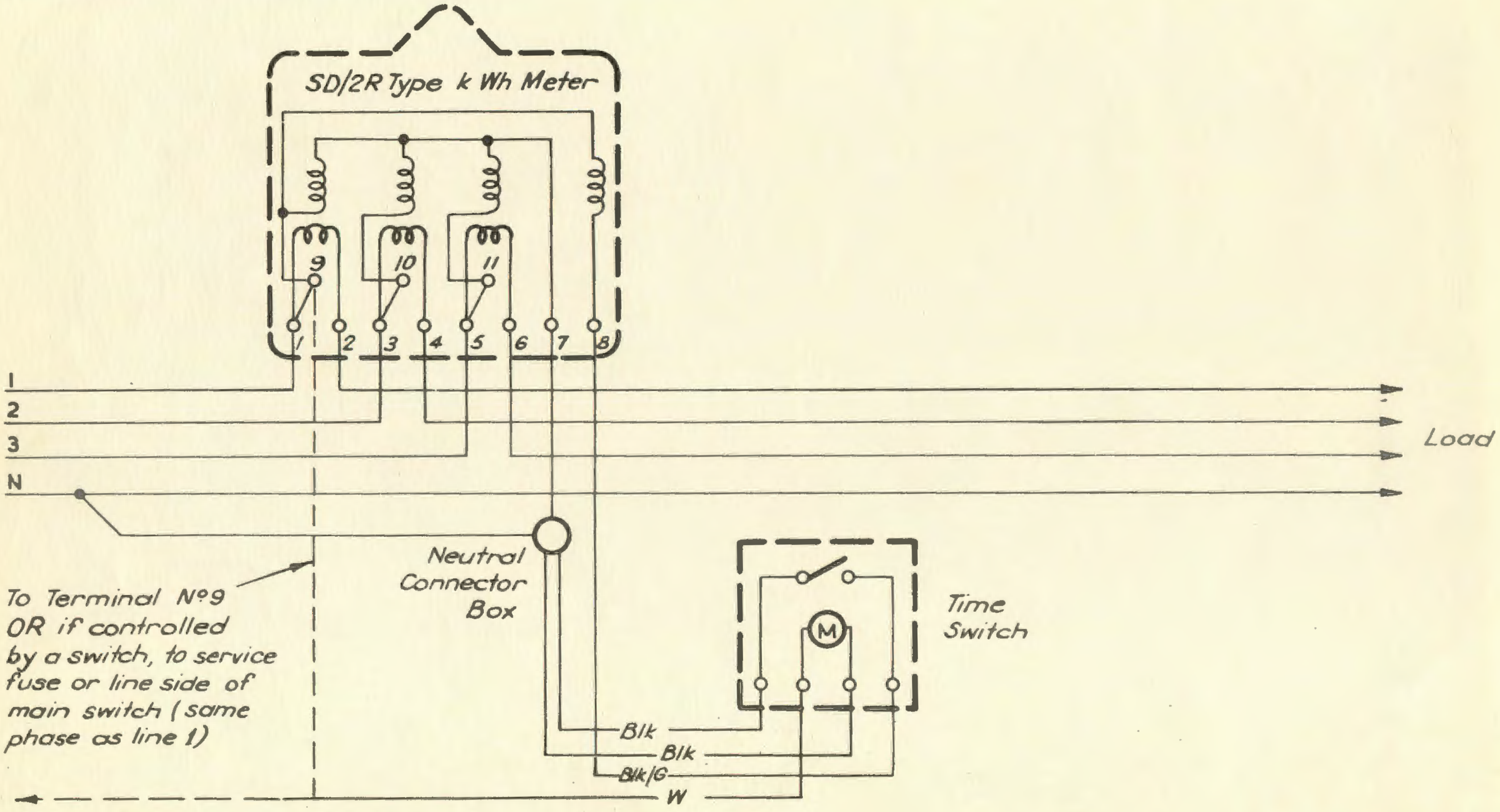
To appropriate active link OR, if controlled by a switch, to service fuse or line side of main switch. Must be one phase only in time switch.

CODE

R : RED
Y : YELLOW
B : BLUE
BLK : BLACK
W : WHITE
G : GREEN

CIRCUIT DIAGRAM 15

CURRENT TRANSFORMER METERING WITH SD/2R TYPE POLYPHASE METER AND TIME SWITCH


SD/2R Type k Wh Meter
9
10
11
1
2
3
4
5
6
7
8
1
2
3
N
Load
Neutral Connector Box
Time Switch
M
Blk
Blk
Blk/G
W
To Terminal Nº9 OR if controlled by a switch, to service fuse or line side of main switch (same phase as line 1)

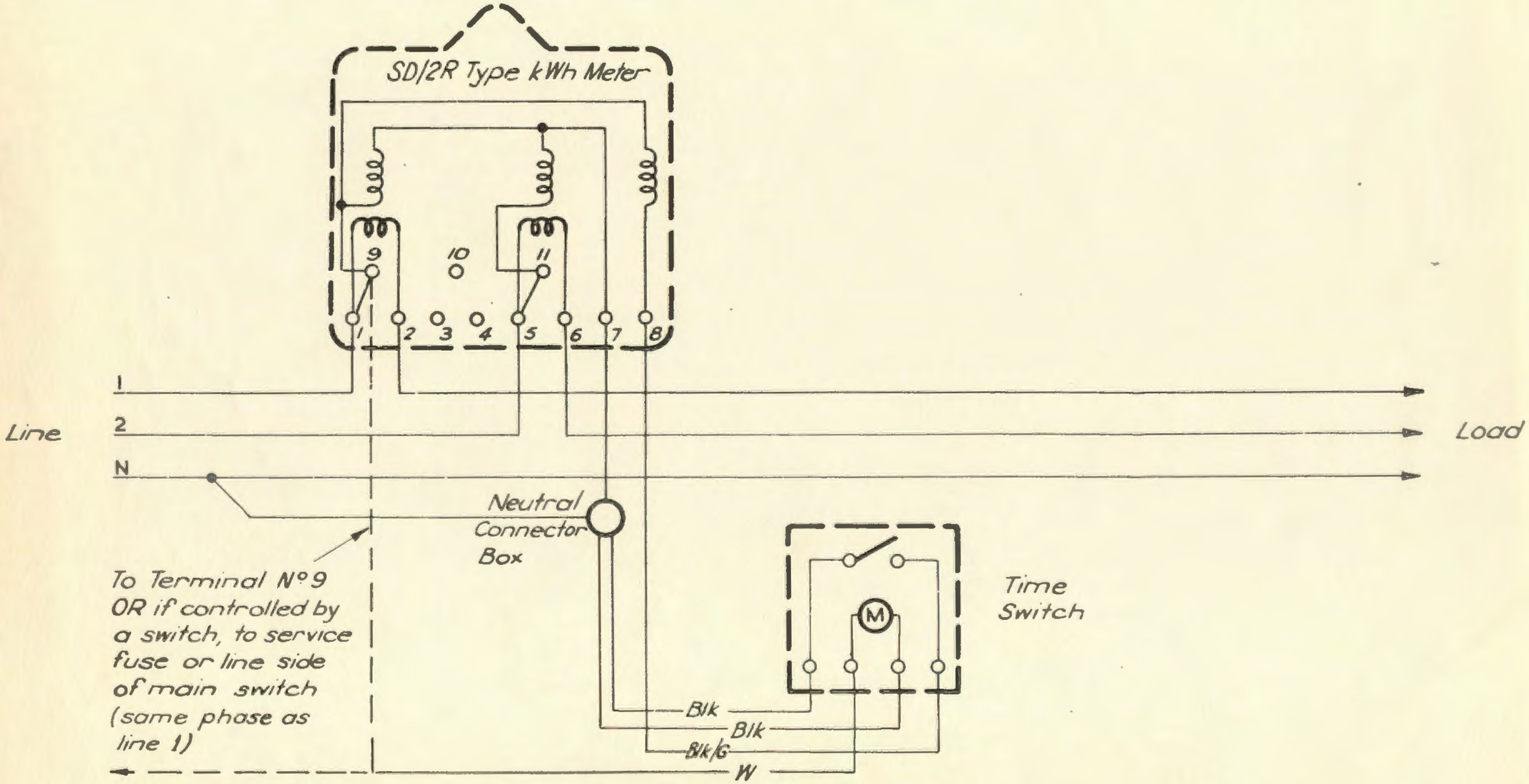
CIRCUIT DIAGRAM 16

WHOLE CURRENT 3 PHASE METERING WITH SD/2R TYPE METER AND TIME SWITCH

NOTE: THE RELAY CIRCUIT NEUTRAL CONDUCTOR IS SWITCHED BY THE TIME SWITCH

CODE

BLK : BLACK
G : GREEN
W : WHITE


SD/2R Type kWh Meter
9
10
11
1
2
3
4
5
6
7
8
1
2
N
Line
Load
Neutral Connector Box
Time Switch
M
Blk
Blk
Blk/G
W
To Terminal N°9 OR if controlled by a switch, to service fuse or line side of main switch (same phase as line 1)

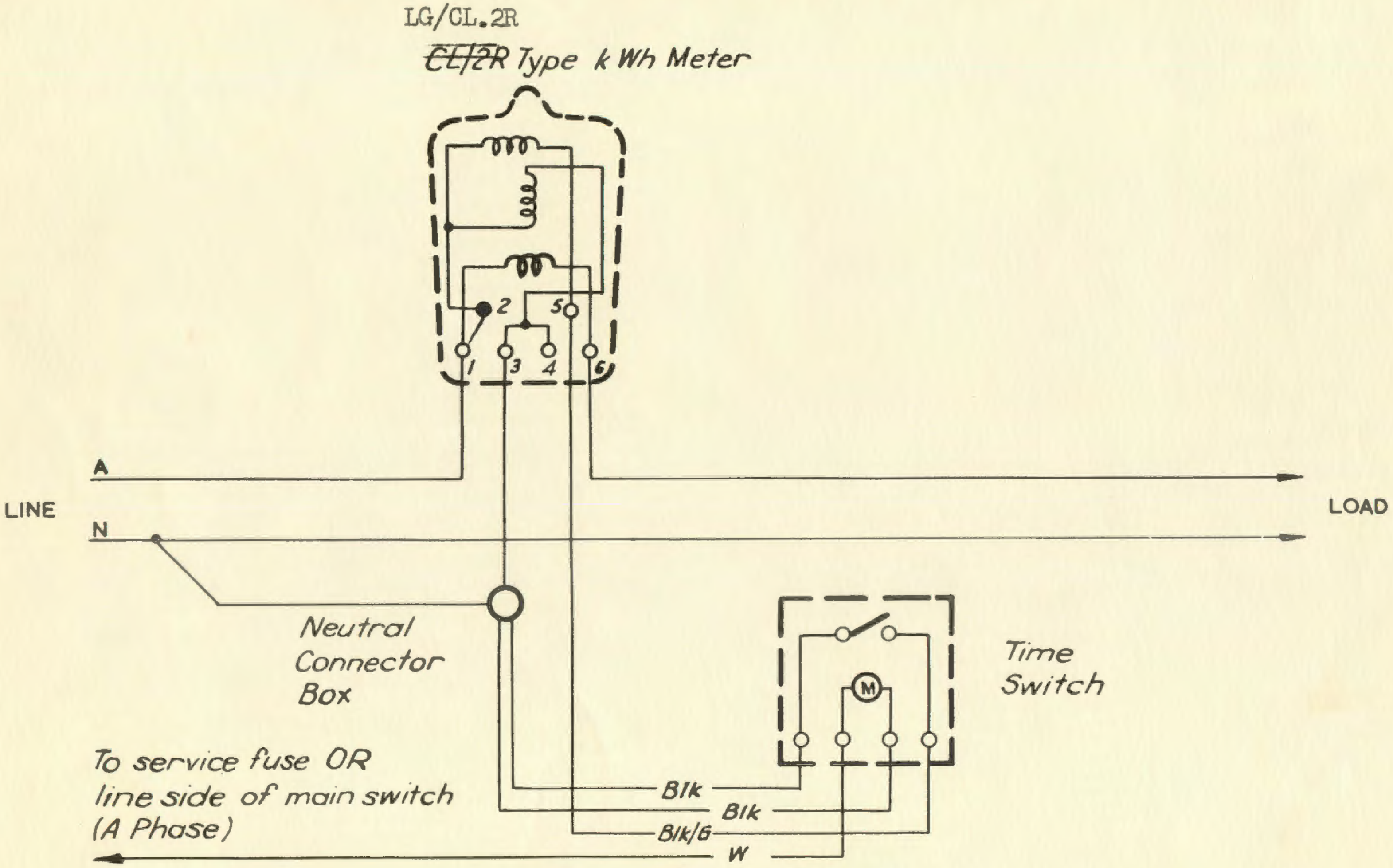
CIRCUIT DIAGRAM 17

WHOLE CURRENT 2 PHASE METERING WITH SD/2R TYPE METER AND TIME SWITCH

NOTE: THE RELAY CIRCUIT NEUTRAL CONDUCTOR IS SWITCHED BY THE TIME SWITCH

CODE

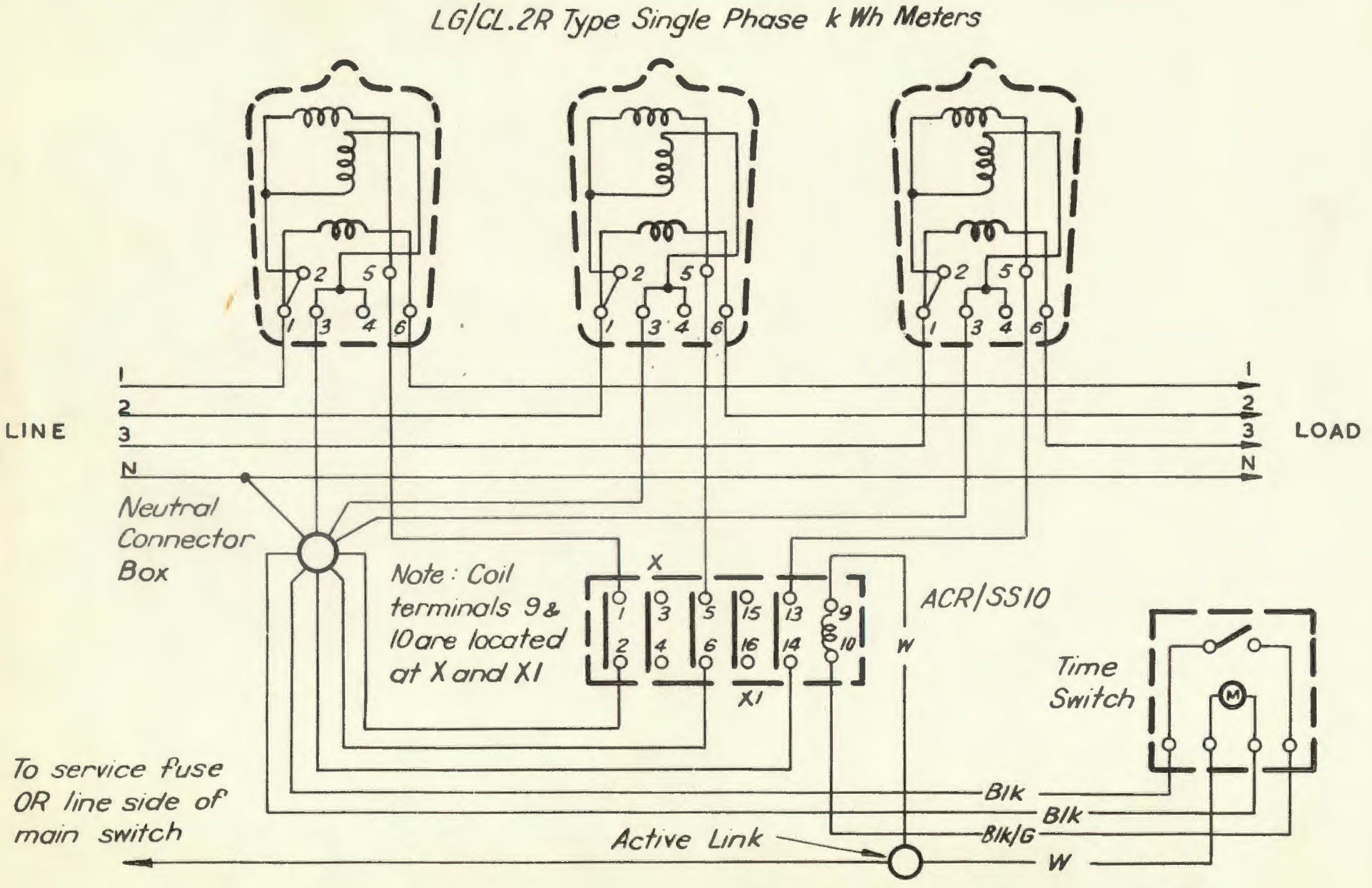
BLK: BLACK
G : GREEN
W : WHITE



CIRCUIT DIAGRAM 18

WHOLE CURRENT SINGLE PHASE METERING WITH ~~CL~~ LG/CL TYPE
2 RATE METER AND TIME SWITCH

CODE
BLK: BLACK
G : GREEN
W : WHITE


LG/CL.2R Type Single Phase k Wh Meters
2
5
1
3
4
6
LINE
1
2
3
N
LOAD
1
2
3
N
Neutral Connector Box
Note: Coil terminals 9& 10are located at X and X1
X
1
2
3
4
5
6
15
16
13
14
9
10
X1
W
ACR/SS10
Time Switch
M
To service fuse OR line side of main switch
Active Link
Blk
Blk
Blk/G
W
W

CIRCUIT DIAGRAM 19

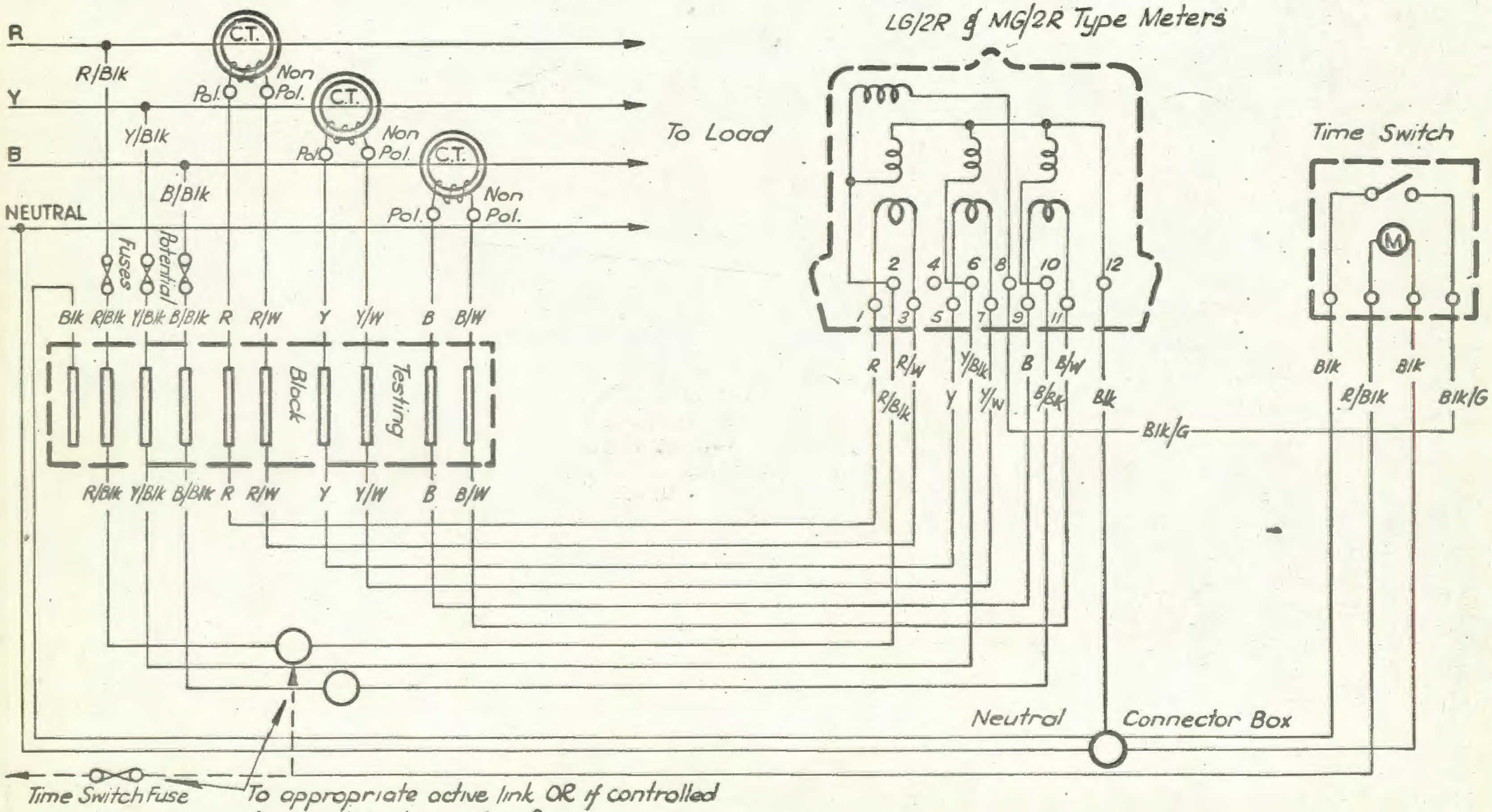
WHOLE CURRENT 3 PHASE METERING WITH LG/CL 2R TYPE METERS, TIME SWITCH AND A.C.R.

NOTES
- THE SWITCHING BY THE TIME SWITCH AND A.C.R. IS DONE IN THE NEUTRAL CONDUCTORS
- IF 2 PHASE METERING ONLY IS REQUIRED OMIT CONNECTIONS FOR MIDDLE METER

CODE
BLK : BLACK
G : GREEN
W : WHITE

SECTION 25.
(AMDT No5 8·7·64)

SUPERSEDING EXISTING DIAGRAM No. 21



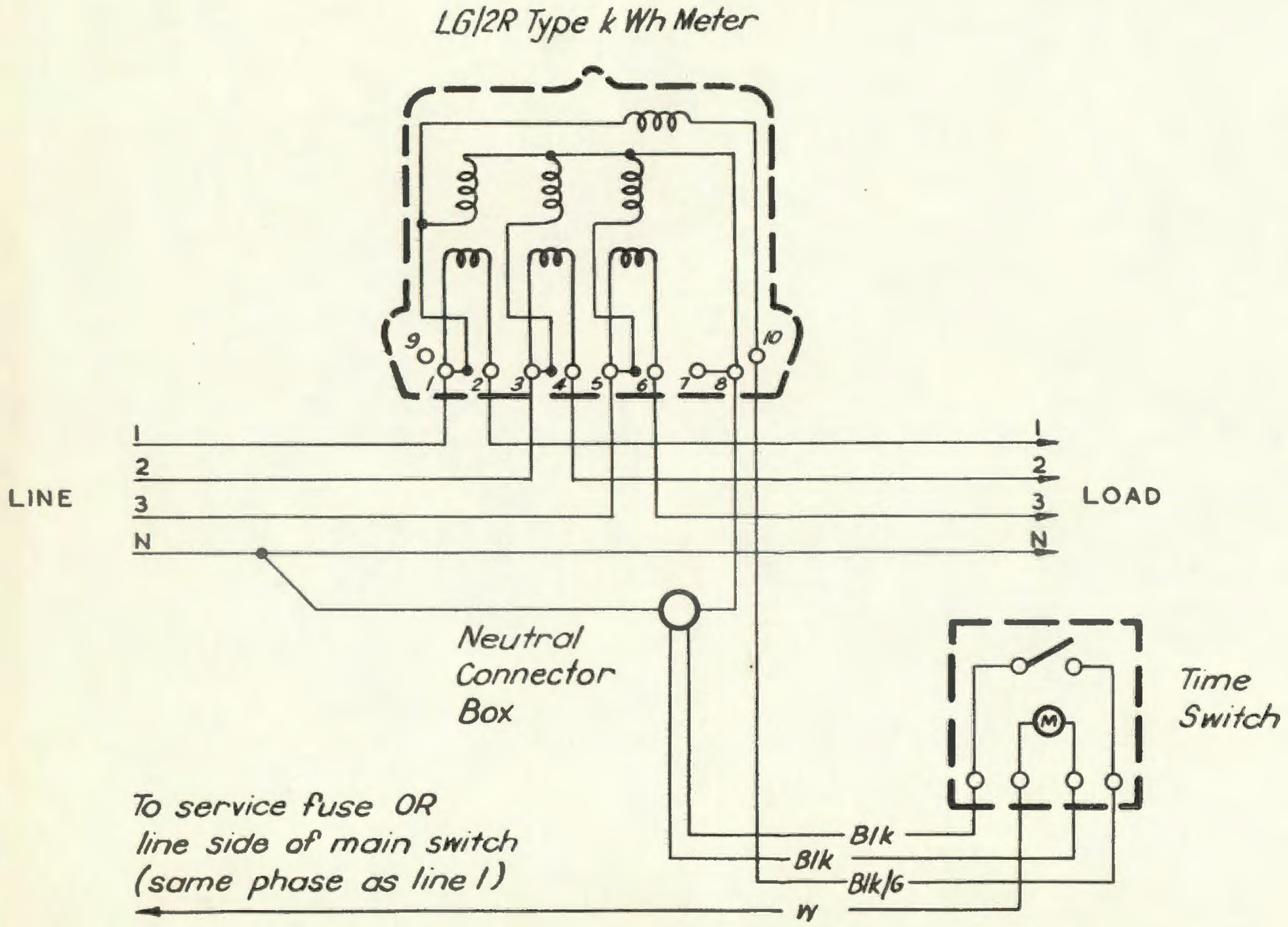
To appropriate active link OR if controlled by a switch, to service fuse or line side of main switch Must be one phase only in time switch.

CODE

R : RED
Y : YELLOW
B : BLUE
BLK : BLACK
G : GREEN
W : WHITE

CIRCUIT DIAGRAM 21

CURRENT TRANSFORMER METERING WITH LG/2R OR MG/2R POLYPHASE METER AND TIME SWITCH

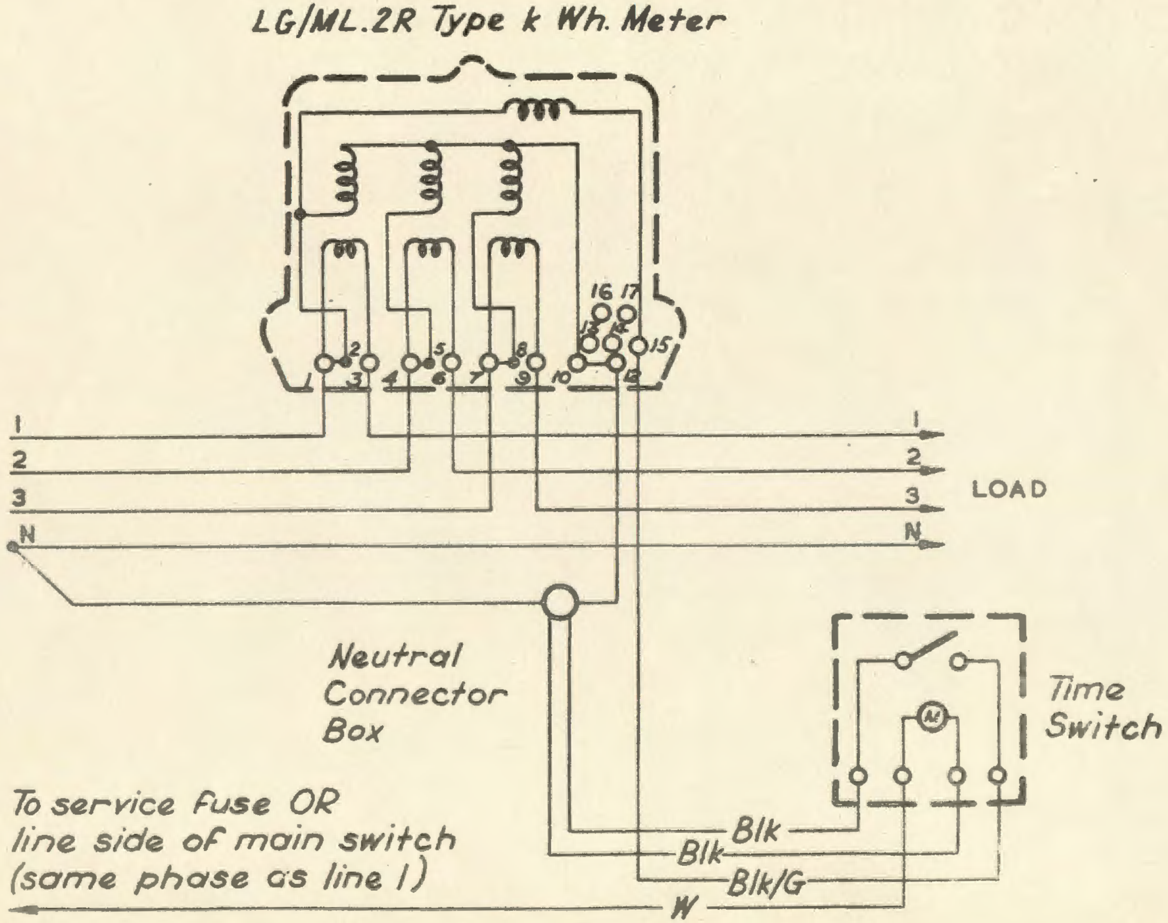


CIRCUIT DIAGRAM 22

WHOLE CURRENT 3 PHASE METERING WITH LG/2R TYPE METER AND TIME SWITCH

CODE
BLK : BLACK
G : GREEN
W : WHITE

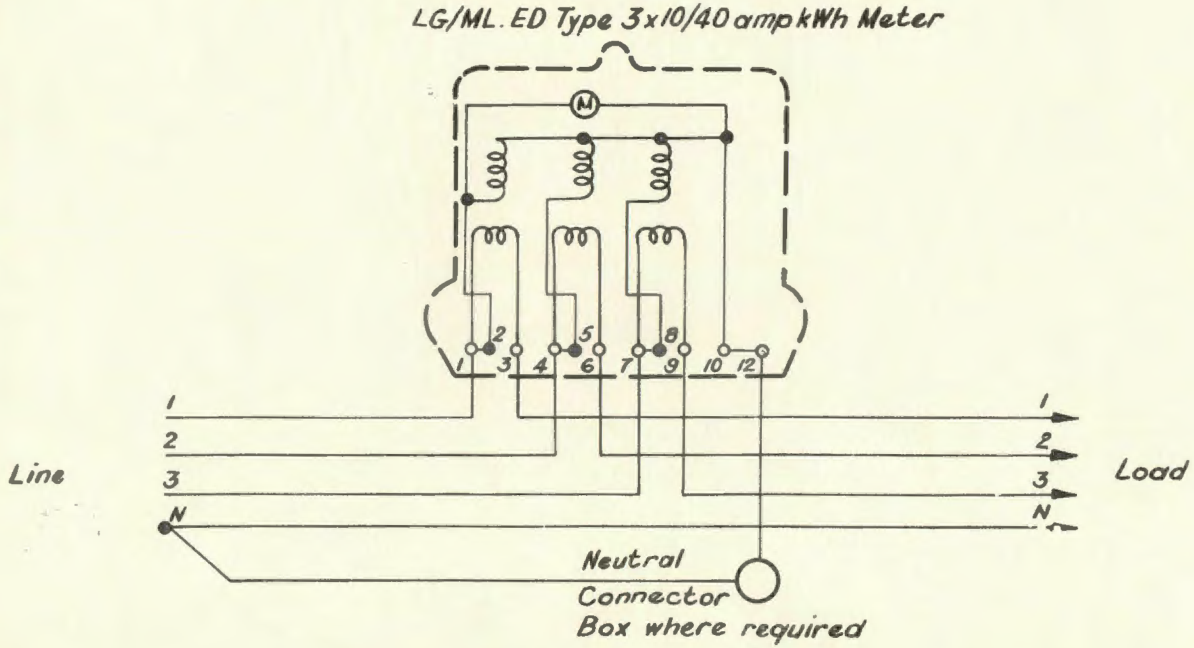
SECTION 25.
(AMDT. No5 8.7.64)


LG/ML.2R Type k Wh. Meter
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
LINE
1
2
3
N
LOAD
1
2
3
N
Neutral Connector Box
Time Switch
M
To service fuse OR line side of main switch (same phase as line 1)
Blk
Blk
Blk/G
W

CODE
BLK: BLACK
G : GREEN
W : WHITE

CIRCUIT DIAGRAM 23

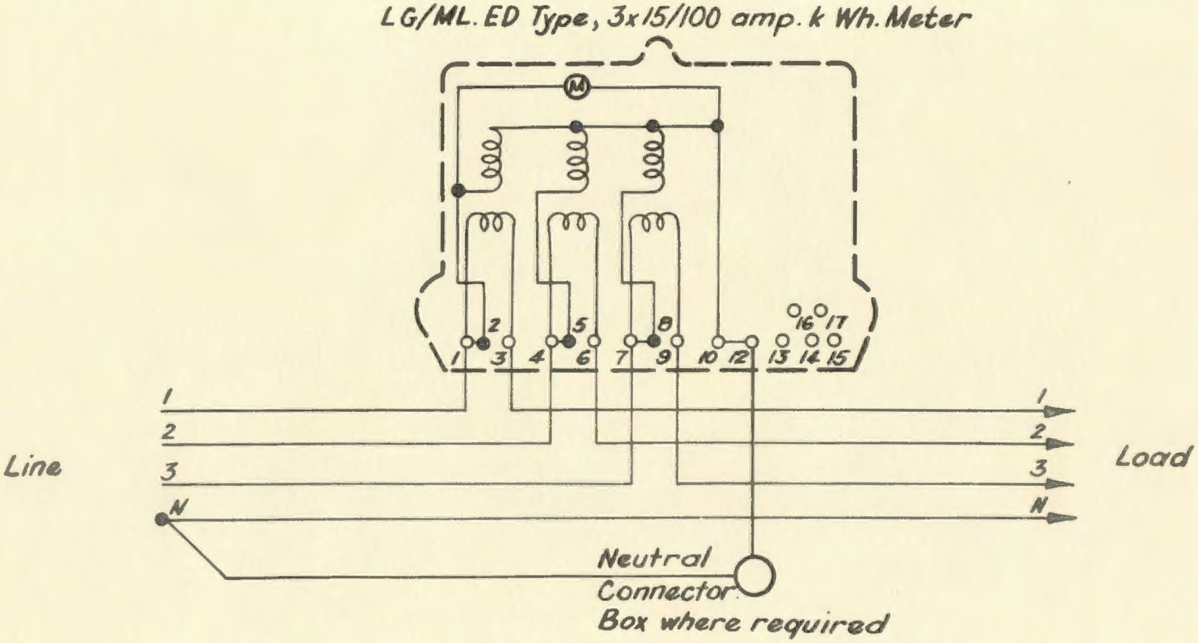
WHOLE CURRENT 3 PHASE METERING WITH LG/ML.2R TYPE METER AND TIME SWITCH



CIRCUIT DIAGRAM 24A

WHOLE CURRENT 3 PHASE METERING WITH LG/ML.ED TYPE, 3X10/40 AMP METER

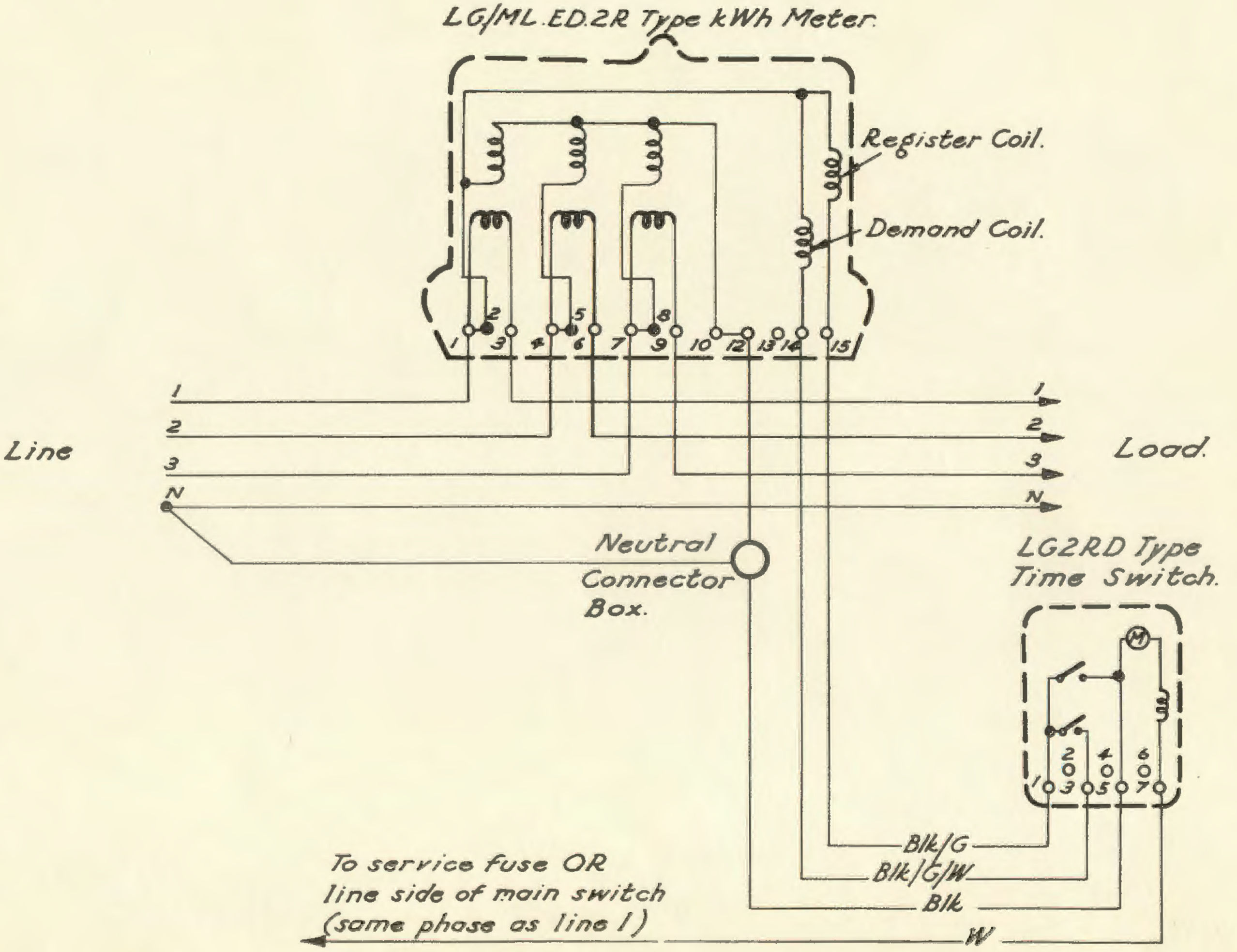
SECTION 25
(AMDT. Nº 15, 1.6.66)



CIRCUIT DIAGRAM 24B

WHOLE CURRENT 3 PHASE METERING WITH LG/ML. ED. TYPE 3X 15/100 AMP METER

SECTION 25
(AMDT. Nº 15 1.6.66)

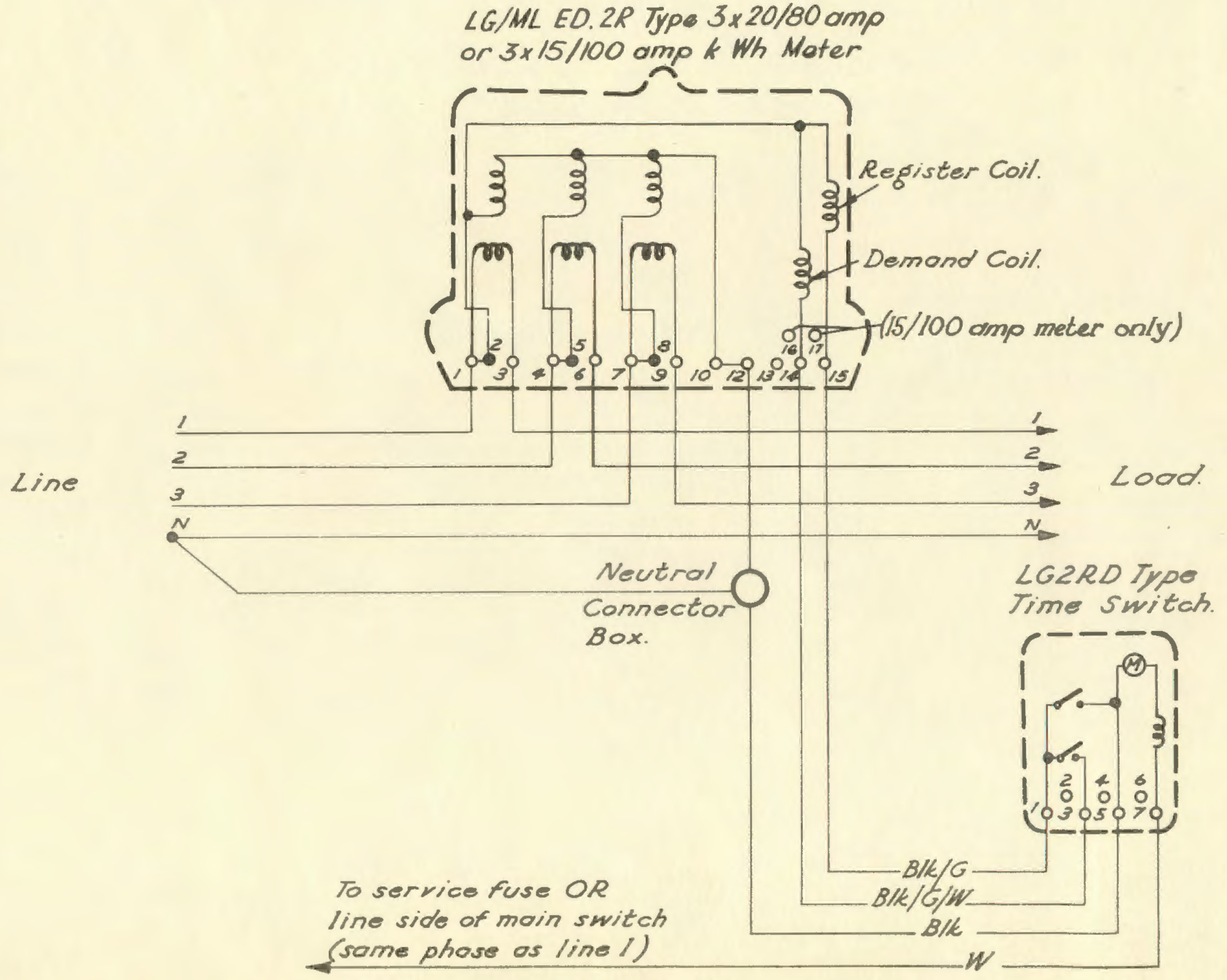


CODE

Blk : BLACK
G : GREEN
W : WHITE

CIRCUIT DIAGRAM 25

WHOLE CURRENT 3 PHASE METERING WITH LG/ML.ED. 2R TYPE METER & LG 2RD TYPE TIME SWITCH.

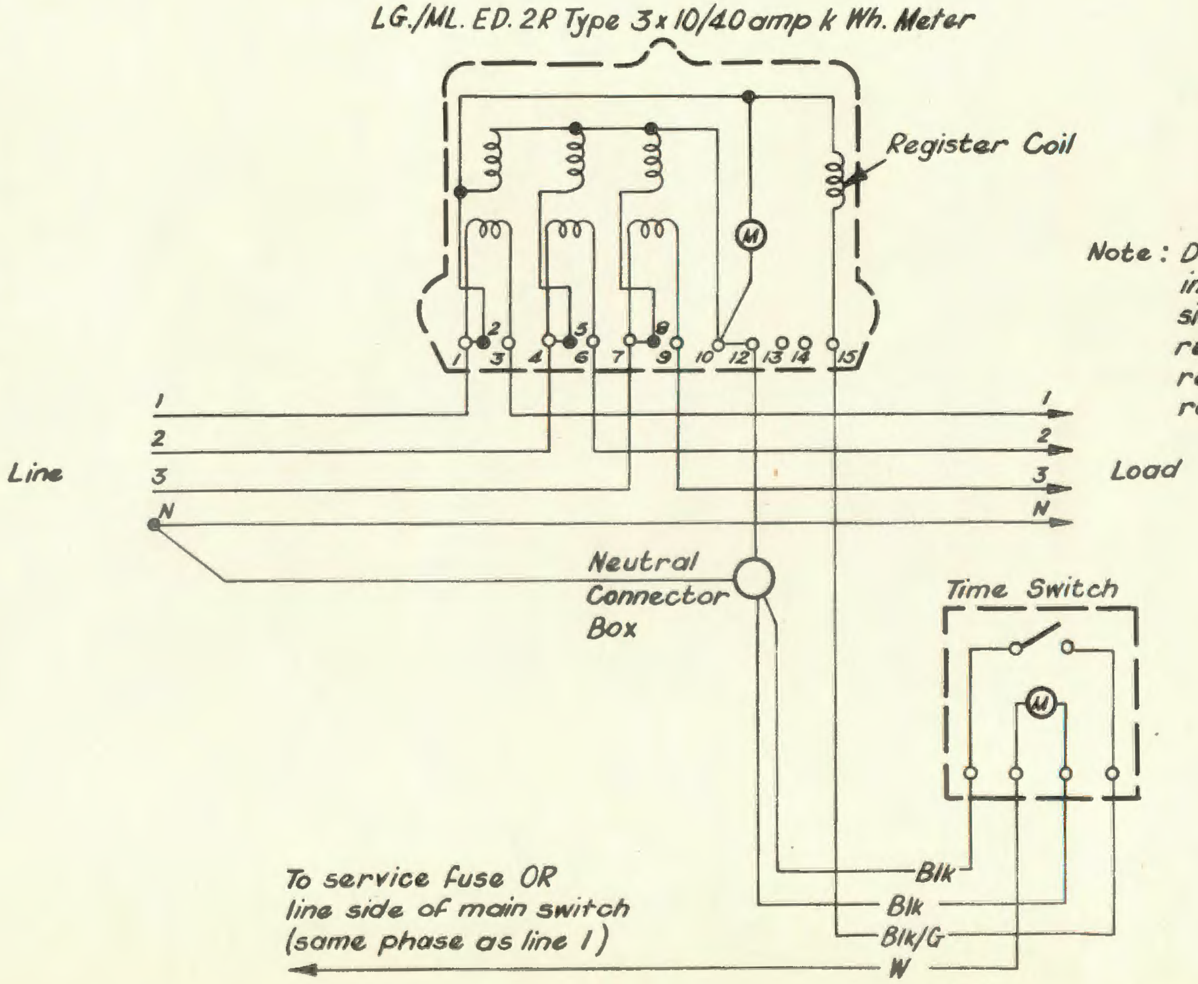


CODE
Blk : BLACK
G : GREEN
W : WHITE

CIRCUIT DIAGRAM 25A

WHOLE CURRENT 3 PHASE METERING WITH LG/ML.ED. 2R TYPE 3X20/80 AMP OR 3X15/100AMP
METER & LG 2RD TYPE TIME SWITCH

SECTION 25
(AMDT. Nº14 1.6.66)



Note: Demand mechanism is internally timed-normal single pole, spring reserve time switch required for two rate register only.

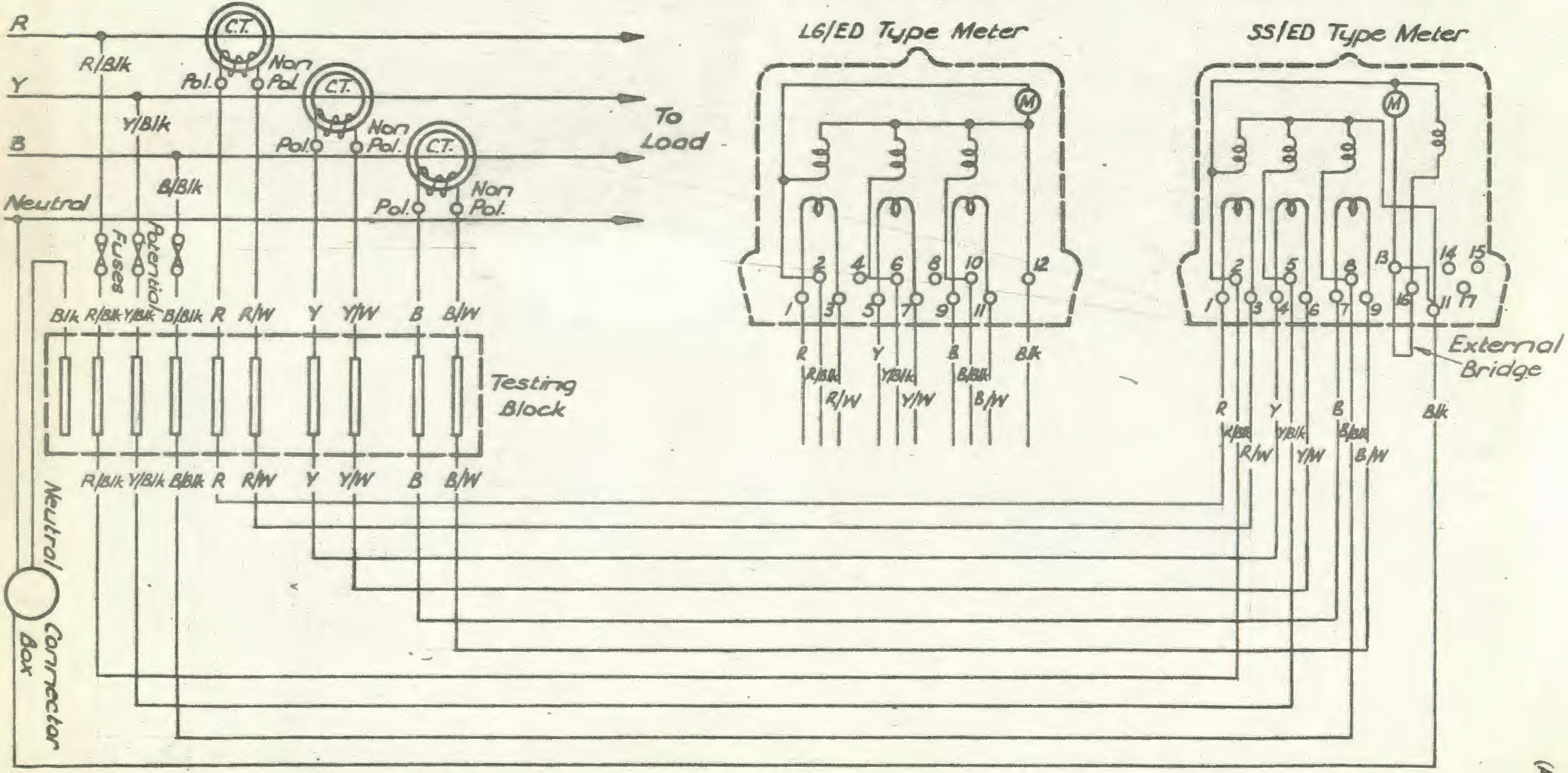
SECTION 25
(AMDT. Nº 14 1.6.66)

CODE
Blk : BLACK
G : GREEN
W : WHITE

CIRCUIT DIAGRAM 25B
WHOLE CURRENT 3 PHASE METERING WITH LG./ML. ED 2R TYPE 3 X 10/40 AMP METER & TIME SWITCH

SUPERSEDING EXISTING DIAGRAM No. 26

Note: If LG/ED meter is modified 2R type see diagram 29A



CODE

R : RED
Y : YELLOW
B : BLUE
Blk : BLACK
W : WHITE

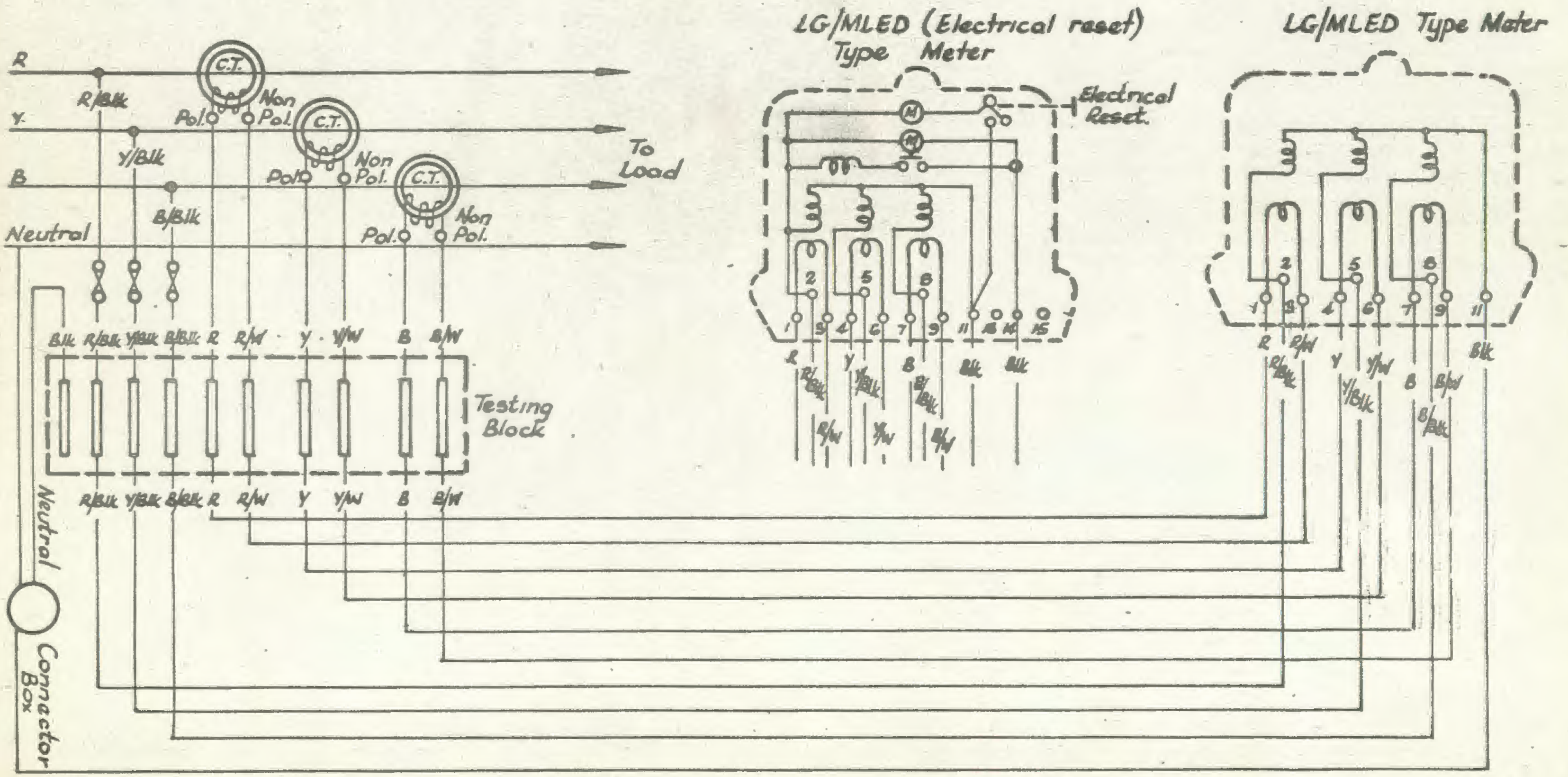
CIRCUIT DIAGRAM 26

CURRENT TRANSFORMER METERING WITH EITHER THE LG/ED OR SS/ED TYPE POLYPHASE METERS.

SUPERSEDING EXISTING DIAGRAM NO. 27

NOTE: If LG/MLED (elect. reset) meter is modified 2R type, see diagram 31A

NOTE: If LG/MLED meter is modified 2R type, see diagram 30A.


LG/MLED (Electrical reset)
Type Meter
Electrical Reset.
LG/MLED Type Meter
R
Y
B
Neutral
R/Blk
Y/Blk
B/Blk
C.T.
Pol.
Non Pol.
To Load
Blk R/Blk Y/Blk B/Blk R R/W Y Y/W B B/W
Testing Block
R/Blk Y/Blk B/Blk R R/W Y Y/W B B/W
Neutral
Connector Box
M
2 5 8
1 3 4 6 7 9 11 13 14 15
R R/Blk R/W Y Y/Blk Y/W B B/Blk B/W Blk Blk
1 3 4 6 7 9 11
R R/W R/Blk Y Y/W Y/Blk B B/W B/Blk Blk

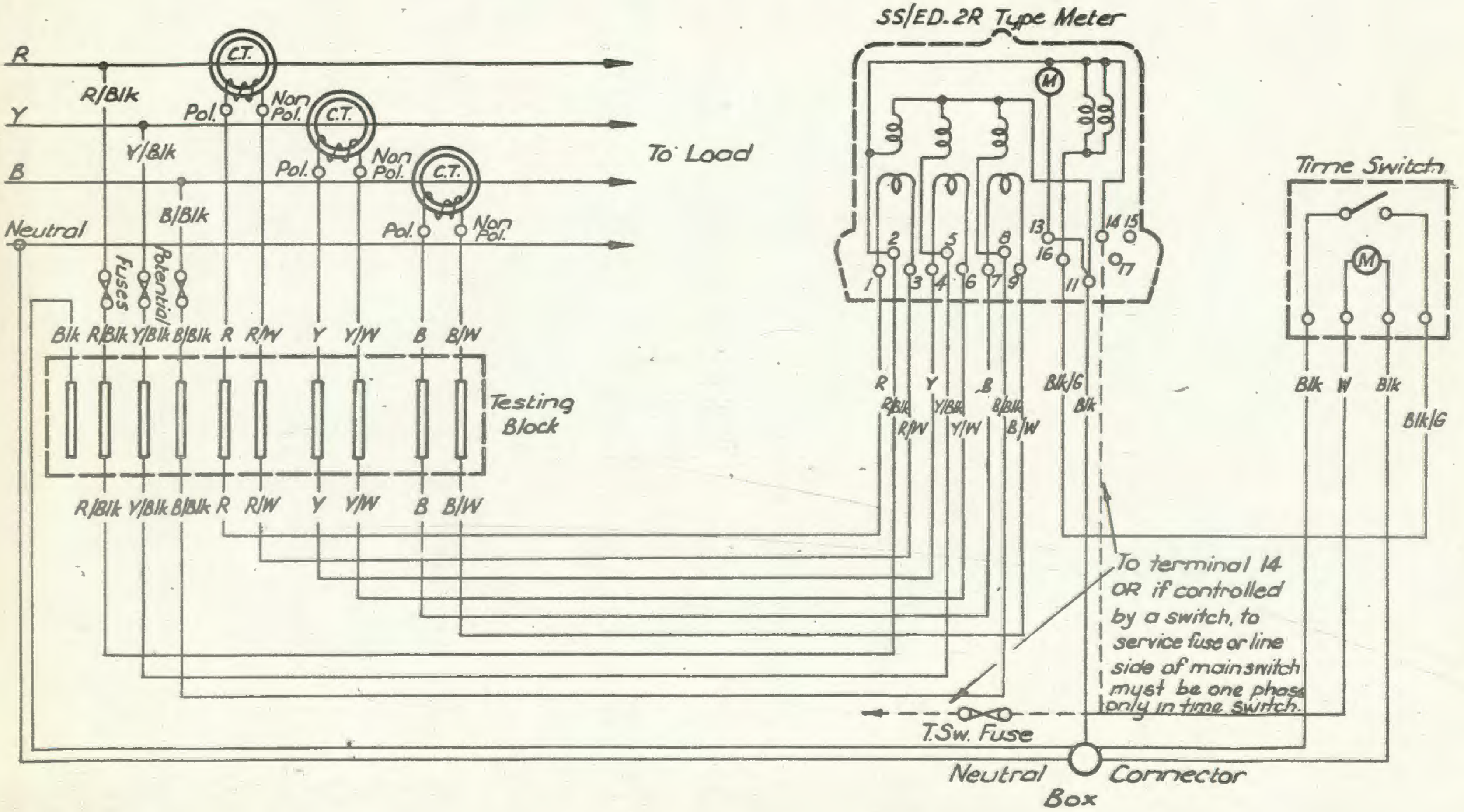
CIRCUIT DIAGRAM 27

CURRENT TRANSFORMER METERING WITH EITHER THE LG/MLED (ELECTRICAL RESET) OR LG/MLED TYPE POLYPHASE METERS.

CODE:

R	:RED
Y	:YELLOW
B	:BLUE
Blk	:BLACK
W	:WHITE

SUPERSEDING EXISTING DIAGRAM No. 28



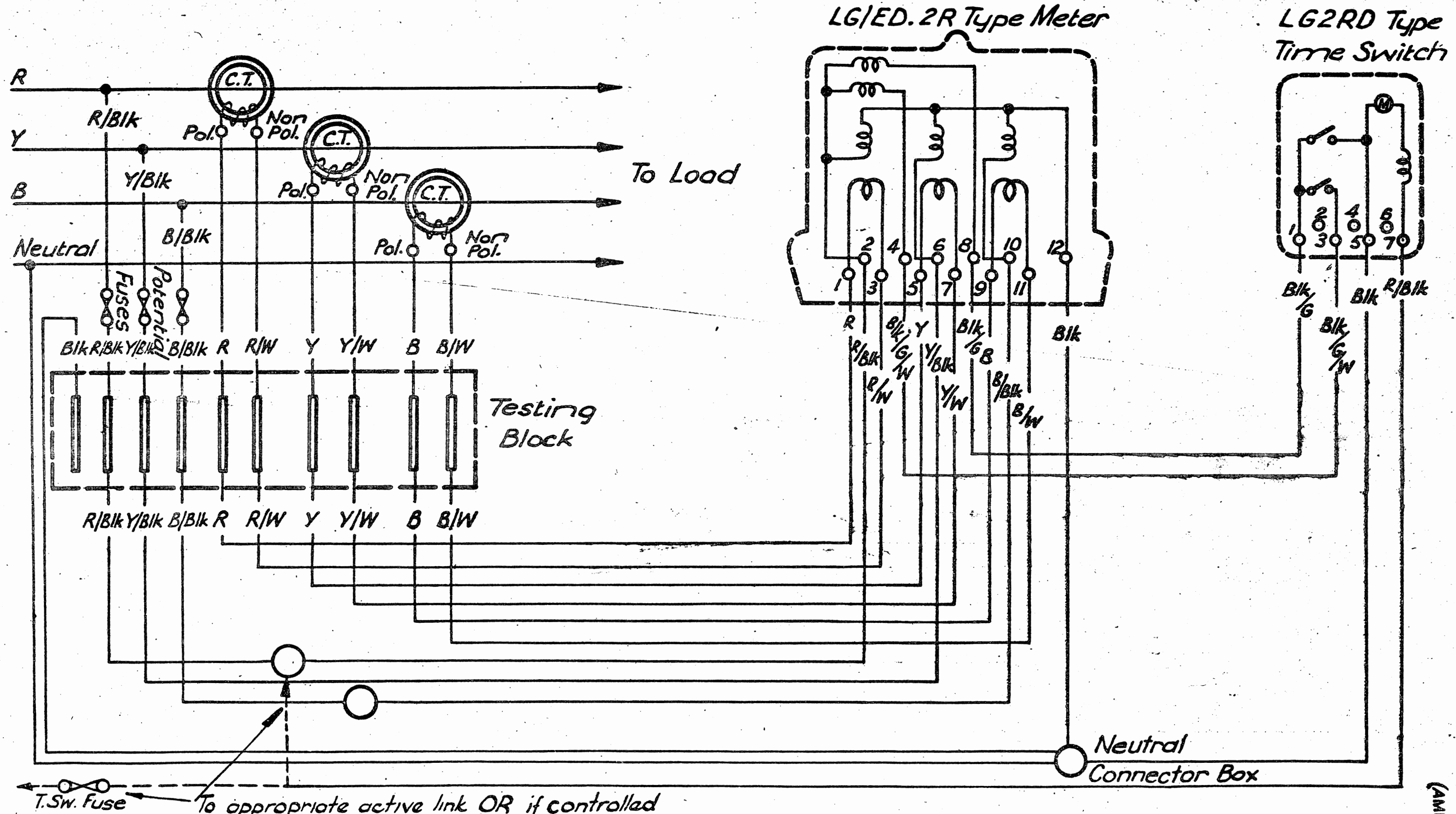
CODE

R : RED
Y : YELLOW
B : BLUE
Blk : BLACK
W : WHITE
G : GREEN

CIRCUIT DIAGRAM 28

CURRENT TRANSFORMER METERING WITH SS/ED.2R TYPE POLYPHASE METER & TIME SWITCH.

SUPERSEDING EXISTING DIAGRAM No. 29



To appropriate active link OR if controlled by a switch, to service fuse or line side of main switch. Must be one phase only in time switch.

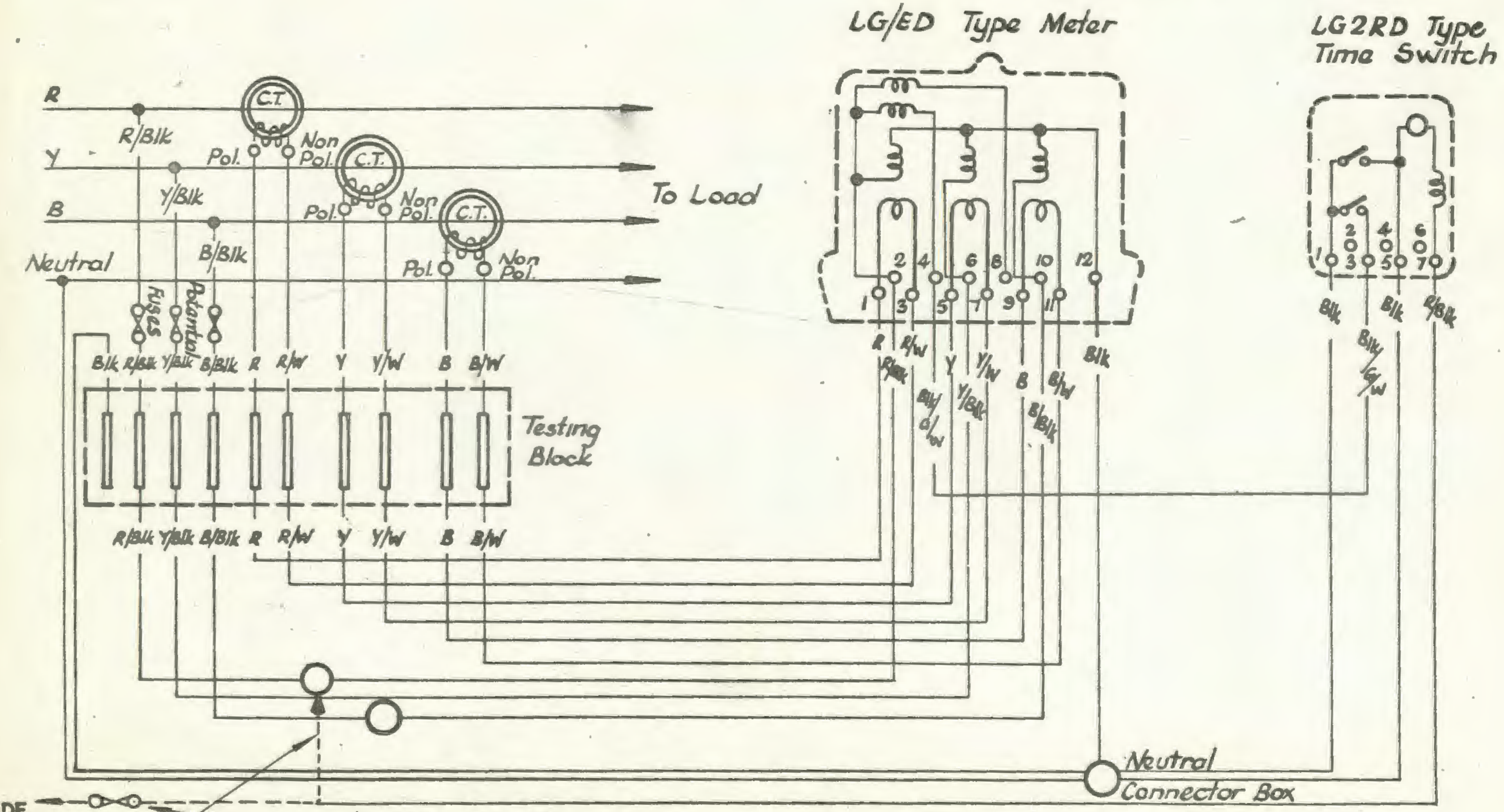
CODE
R :RED
Y :YELLOW
B :BLUE
Blk :BLACK
W :WHITE
G :GREEN

CIRCUIT DIAGRAM 29

CURRENT TRANSFORMER METERING WITH LG/ED.2R TYPE POLYPHASE METER AND TIME SWITCH.

METERING INSTRUCTION BOOK
ADDITIONAL DIAGRAM No. 29 A

Note: This is a modified 2R. meter with high register blanked out. T. Sw. still required for external timing of demand interval.
For standard LG/ED meter see diagram 26



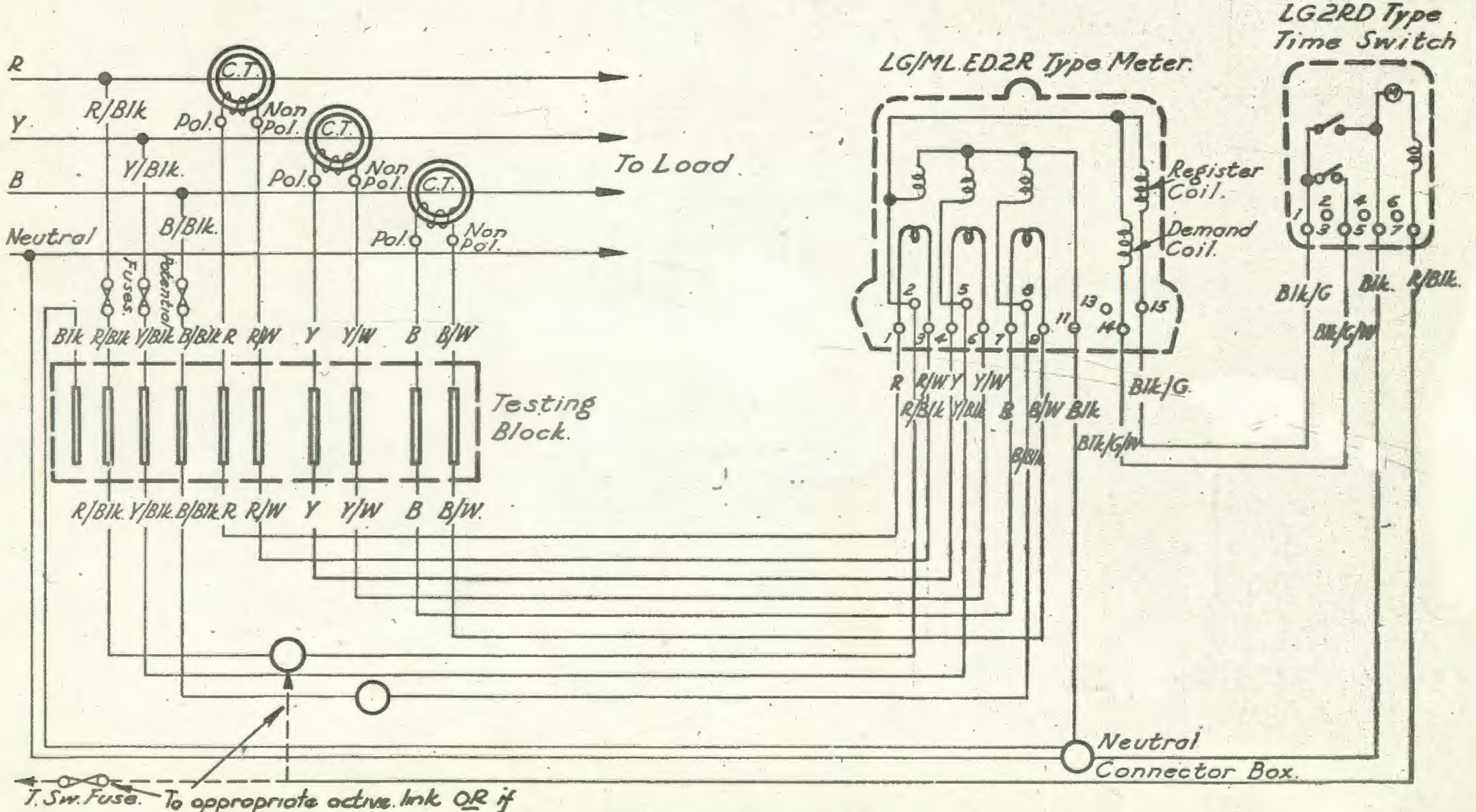
CODE
R : RED
Y : YELLOW
B : BLUE
BIK : BLACK
W : WHITE
G : GREEN

To appropriate active link OR, if controlled by a switch, to service fuse or line side of main switch. Must be one phase only in time switch.

CIRCUIT DIAGRAM 29A

CURRENT TRANSFORMER METERING WITH LG/ED (MODIFIED 2R) TYPE POLYPHASE METER AND TIME SWITCH

METERING INSTRUCTION BOOK - SECTION 25
SUPERSEDING EXISTING DIAGRAM Nº 30



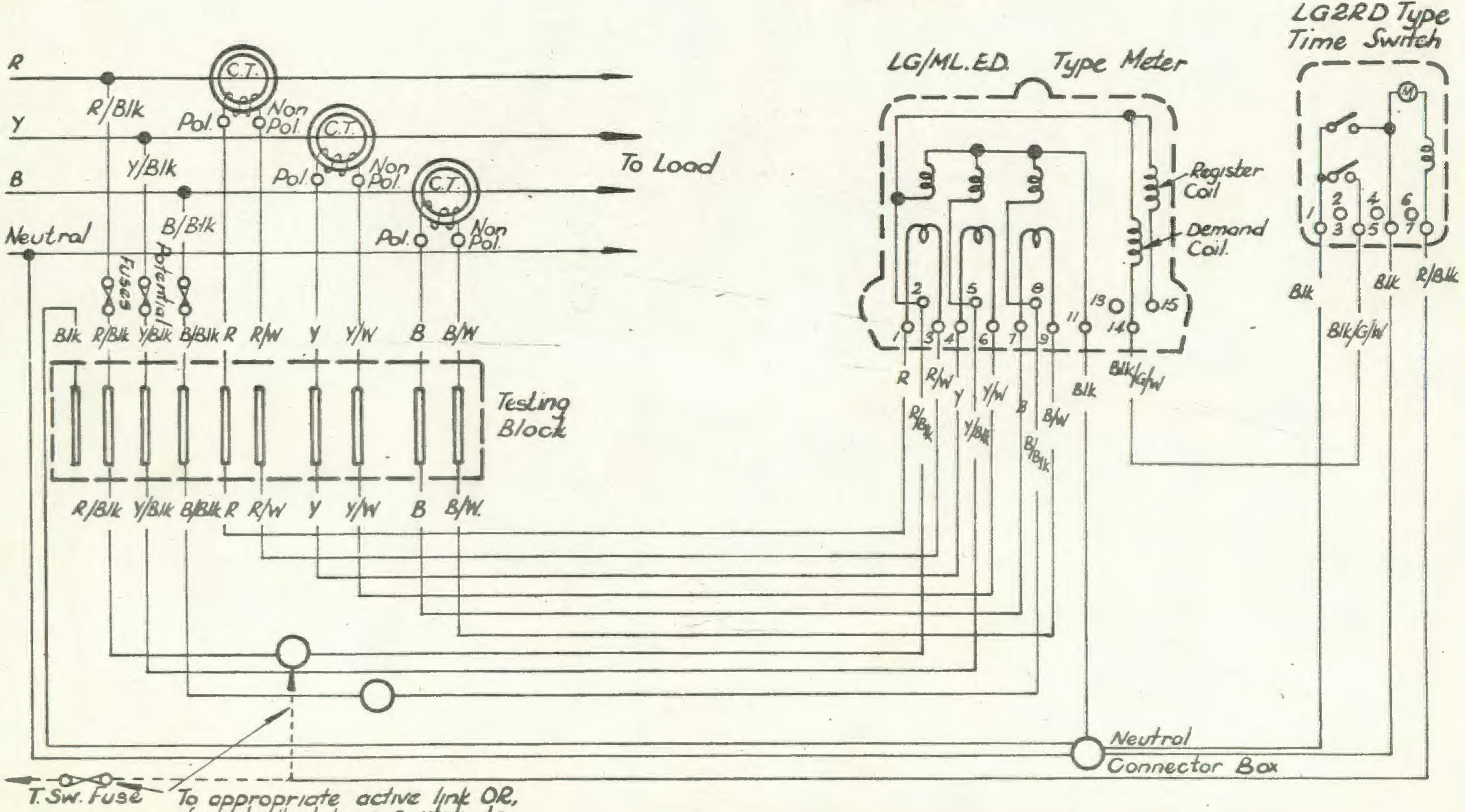
To appropriate active link OR if controlled by a switch, to service fuse or line side of main switch, Must be one phase only in time switch.

CODE
R : RED
Y : YELLOW
B : BLUE
Blk : BLACK
W : WHITE
G : GREEN

CIRCUIT DIAGRAM 30

CURRENT TRANSFORMER METERING WITH LG/ML.ED.2R TYPE POLYPHASE METER AND TIME SWITCH.

NOTE: This is a modified 2R Meter with high register blanked out. T.Sw. still required for external timing of demand interval. For standard LG/ML. ED meter see diagram 27.



To appropriate active link OR, if controlled by a switch, to service fuse or line side of main switch. Must be one phase only in time switch

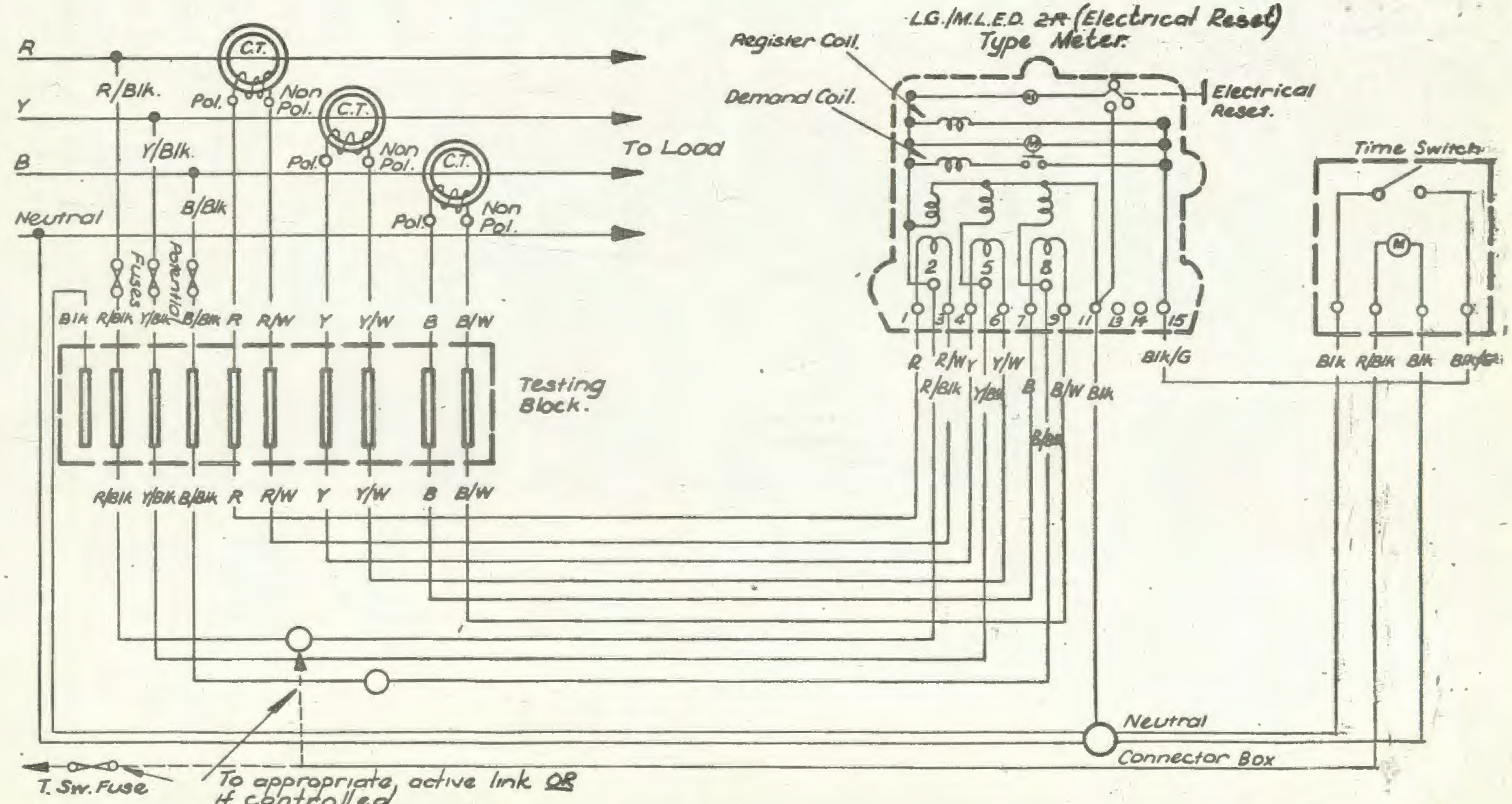
CODE

R :RED
Y :YELLOW
B :BLUE
BIK : BLACK
W :WHITE
G :GREEN

CIRCUIT DIAGRAM 30A

CURRENT TRANSFORMER METERING WITH LG/ML. E.D. (MODIFIED 2R) TYPE POLYPHASE METER AND TIME SWITCH

SUPERSEDING EXISTING DIAGRAM No. 31



To appropriate, active link OR if controlled by a switch, to service fuse or line side of main switch. Must be one phase only in time switch.

CODE

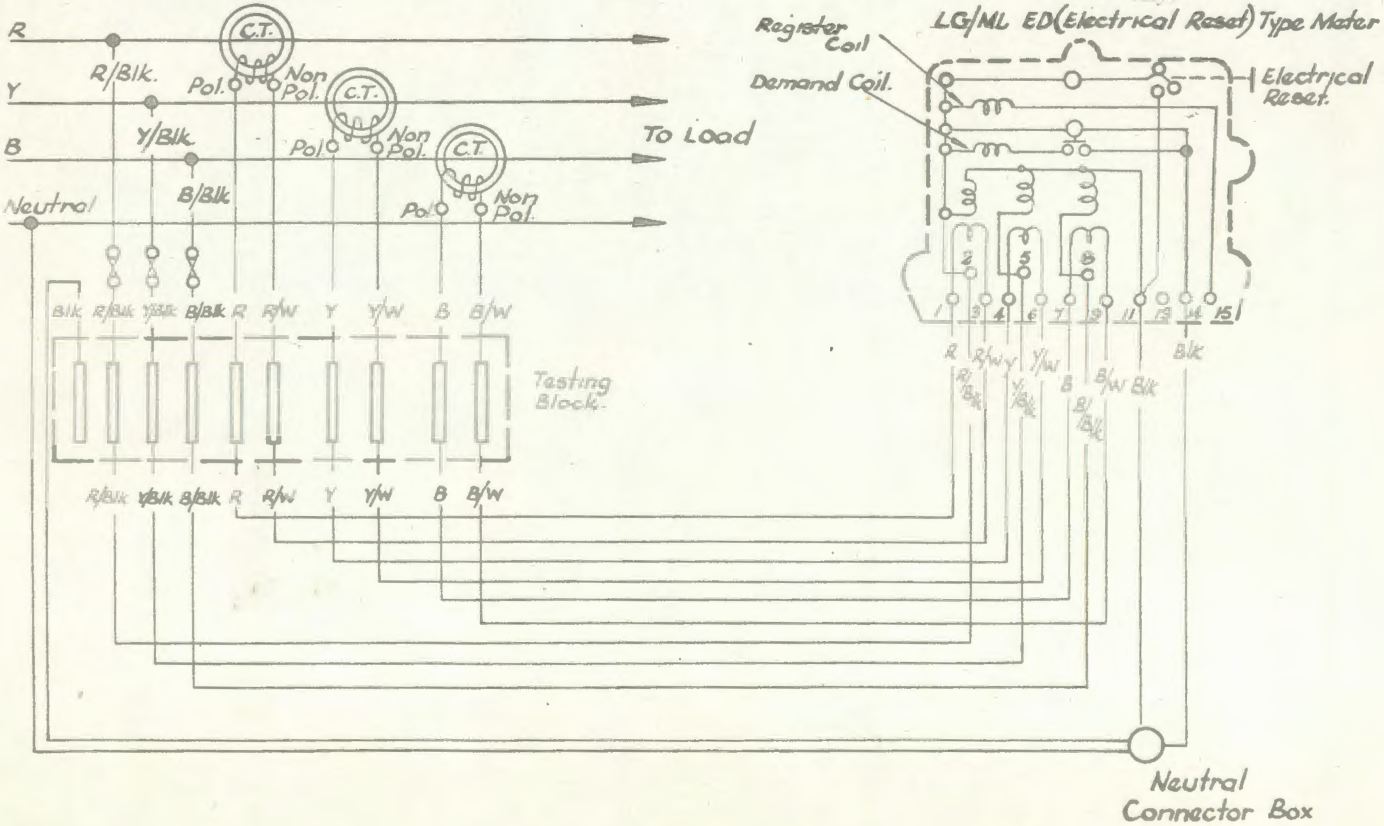
R :RED
Y :YELLOW
B :BLUE
Blk : BLACK
W :WHITE
G :GREEN

CIRCUIT DIAGRAM 31

CURRENT TRANSFORMER METERING WITH LG/ML.ED. 2R (ELECTRICAL RESET) TYPE POLYPHASE METER AND TIME SWITCH

SECTION 25
(AMDT No. 23 17.7.68)

Note: This is a modified 2R meter with high register blanked out. For standard LG/ML.ED (Electrical Reset) meter see diagram 27.



CODE
R :RED
Y :YELLOW
B :BLUE
BIK :BLACK
W :WHITE
G :GREEN

CIRCUIT DIAGRAM 31 A

CURRENT TRANSFORMER METERING WITH LG ML.E.D.
(MODIFIED - 2R - ELECTRICAL RESET) TYPE
POLYPHASE METER AND TIME SWITCH

METERING INSTRUCTION BOOK

No. 38

Issued to J. E. COGHLAN.

AMENDMENTS

Date 12.11.63.

This booklet is compiled in loose leaf form to facilitate amendment. Amendments will be issued from time to time and will be numbered. Where necessary, amendments will be replacement sheets which will show the date of issue.

The number, section, page number and date of all amendments should be entered in this table by the person entering the amendment or inserting the replacement sheet in this booklet.

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METERING INSTRUCTION BOOK

No. 38

AMENDMENTS

Issued to J. E. COGHLAN

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